U.S. Department of the Interior
National Park Service

Inventory and Monitoring Program

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

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Prepared for:

Northern Colorado Plateau Network Inventory and Monitoring Program
National Park Service, U.S. Department of the Interior

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

Important Note: This sampling protocol consists of this Protocol Narrative and the following Standard Operating Procedures (SOPs):

SOP 1: Before the Field Season
SOP 2: Training Observers
SOP 3: Using Global Positioning System (GPS) Units
SOP 4: Documenting Territory and Nest Site Location
SOP 5: Conducting the Peregrine Falcon Survey
SOP 6: Contaminant Monitoring
SOP 7: Data Management
SOP 8: Data Analysis and Reporting
SOP 9: After the Field Season
SOP 10: Revising the Protocol Narrative and SOPs

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I. Background and Objectives

Issue Being Addressed and Rationale for Monitoring the American Peregrine Falcon (*Falco peregrinus anatum*)

Extensive population declines caused by the eggshell thinning effects of DDT metabolites led to the listing of the American Peregrine Falcon (hereafter, Peregrine Falcon) under the Endangered Species Act of 1973. Recovery efforts, including the banning of DDT as well as captive breeding and release, resulted in the formal delisting of this species in August of 1999 (Mesta 1999). Section 4(g)(1) of the Endangered Species Act requires a post-delisting monitoring period of at least 5 years for species removed from the list. In 2003, the U.S. Fish and Wildlife Service (USFWS) released its peer reviewed Plan for fulfilling this requirement, titled, *Monitoring Plan for the American Peregrine Falcon* (U.S. Fish and Wildlife Service 2003).

The Peregrine Falcon breeds throughout the Colorado Plateau, and occurs in 10 of the 16 Northern Colorado Plateau Network (NCPN) park units - Arches N.P., Black Canyon of the Gunnison N.P., Bryce Canyon N.P., Canyonlands N.P., Capitol Reef N.P., Colorado N.M, Curecanti N.R.A., Dinosaur N.M., Natural Bridges N.M., and Zion N.P. Monitoring of Peregrine Falcon populations is a high priority for the overall NCPN, and is included in the NCPN conceptual model as an at-risk Focal Taxa. In an ecosystem context, the Peregrine Falcon is a top trophic-level predator. Preserving ecosystem integrity, in part, requires maintaining a functional trophic structure. Additionally, public interest in the species together with federal law are motivaters to ensure that populations are recovering, and to document park-level populations in need of special conservation efforts.

Historical Development of Peregrine Falcon Monitoring in NCPN Park Units

Since the listing of the Peregrine Falcon in 1973, inventory and monitoring of the Peregrine Falcon has been ongoing at various intensities in 10 of the 16 NCPN park units (listed above). No detailed, standard protocol for monitoring the Peregrine Falcon existed in earlier years for park units in this region. However, beginning in the late 1980s NCPN personnel generally followed protocols developed by researchers in Alaska (Skip Ambrose, pers. comm., 2004). These protocols were adopted and, for the most part, continue to be used by researchers in the NCPN park units (Mike Britten, pers. comm., 2004). This protocol is hereafter referred to as the NCPN protocol.

The USFWS Monitoring Plan and NCPN Participation. The USFWS Monitoring Plan for the American Peregrine Falcon (hereafter, the USFWS plan) requires the monitoring of a randomly selected sample of territories every three years in each of four regions of the original Peregrine Falcon recovery effort (U.S. Fish and Wildlife Service 2003). Regional results will be used to infer nation-wide trends and to compare against criteria identified in the USFWS plan. The primary objective of the USFWS plan, within each region, is to detect changes in three key parameters: territory occupancy, nest success, and productivity. A contaminant monitoring component is included in the USFWS plan for a variable subset (two) of the recovery regions. NCPN park units are in the Rocky

Mountain Peregrine Falcon Recovery Region. This region was not initially included in the national USFWS plan for monitoring contaminants. It may be chosen in future sampling years.

Ninety-six territories in the Rocky Mountain Peregrine Falcon Recovery Region were randomly selected for population monitoring in 2003. Of these 96 territories, 12 occurred within NPS units (6 sites in Zion, 1 site each in Canyonlands, Black Canyon of the Gunnison, Bryce Canyon, Capitol Reef, Mesa Verde, and Dinosaur). Most of the known territories in NCPN park units are not included in the national monitoring effort.

The USFWS protocol for monitoring the three key parameters is consistent with past monitoring methods within NCPN park units, with exceptions. The USFWS plan departs from standard raptor monitoring protocol in terms of the age at which nestlings are counted in determining nest productivity. The USFWS plan calls for counting nestlings at 28 days, whereas standard raptor monitoring protocol counts nestlings at 80% of fledging age (34 days) (Pendleton et al. 1987). This standard has been used in previous NCPN monitoring efforts. Also, the USFWS Plan monitors substantially fewer territories in NCPN park units than what park staff historically have monitored.

NCPN Protocol for Monitoring the American Peregrine Falcon. The NCPN protocol will provide data required by the USFWS monitoring plan, but will also be expanded in scope to provide more detailed information on Peregrine Falcons in NCPN park units. The USFWS plan encourages continued monitoring of Peregrine Falcon territories outside of those selected by the program, and will actively seek these data to incorporate into its national trend analysis. The NCPN protocol uses survey methods previously used in Alaska and NCPN park units.

The NCPN Inventory and Monitoring program is not directly involved in monitoring Threatened Endangered and Sensitive (TES) vertebrate species. The role of the NCPN monitoring program is to develop and update protocols for TES vertebrates, and to distribute protocols to parks upon request. Individual park units are responsible for obtaining funding for, and conducting TES vertebrate monitoring. Overall guidance and data management support will be provided by the NCPN, if requested.

Measurable Objectives

There are three objectives for the Peregrine Falcon monitoring program:

1. Determine annual status and trends in territory occupancy of Peregrine Falcons
2. Determine annual status and trends in nest success of Peregrine Falcons
3. Determine annual status and trends in productivity of Peregrine Falcons

Associated sampling objectives are undetermined at this time. The USFWS protocol is designed to achieve an 80% probability of detecting a decline of 12.5 percentage decline in territory occupancy and in nest success after the first sampling occasion (3-yr interval) with a Type I error of 10%. Before adopting this standard, an assessment of the historical variation in Peregrine Falcon populations is needed to determine the level of change for

all three key parameters that should receive attention and management action. Upon completion of this assessment, recommendations will be incorporated into this protocol.

II. Sampling Design

The USFWS plan specifies a sampling design based on a list of territories known to have been used between 1999 and 2002. Territories used before or after these years are not included. Territories to be surveyed were randomly selected from this list of known territories. Only 12 of the selected territories were located in NCPN units for the initial year of sampling (2003). Another random draw from the above list of known territories may be used to identify the second round of sampling (2006).

The sampling design of this NCPN protocol deviates from the USFWS plan, but follows the sampling strategy used in prior NCPN and Alaska surveys. This approach focuses on index study areas rather than only known territories. Index study areas are fixed stretches of rivers or cliffs which will be identified in park units with nesting Peregrine Falcons. All known and potential territories should be surveyed annually within these areas. The frequency of surveys, and size of areas surveyed will ultimately depend on the available funding.

Rationale for Selecting This Sampling Design

The approach of surveying index areas rather than specific territories is favored by NCPN for several reasons. By completely re-surveying an established study area annually, new territories will be discovered which will provide information about the continuing recovery of Peregrine Falcons. The USFWS protocol has a potential bias by not looking at poor quality or infrequently used territories. Thorough surveys of index study areas do not have this bias; all potential territories, regardless of quality or use, are surveyed annually. This is important because low quality, seldom-used territories are the ones most likely to be vacated as a result of population decline. Thus changes in population parameters may be detected sooner when surveying a given area rather than only known territories. Additionally, pairs which move to a new cliff face will more likely be found by a complete survey of a study area, thus improving estimates of percent occupancy. Moreover, since observers are able to spend more time in one study area, compared to traveling to widely dispersed nest territories, more detailed information is acquired on the local population in the index area.

It is likely that these index areas can be used to infer trends across the NCPN. Using index areas as representative units of a larger local population was proposed in the Peregrine Falcon Recovery Plan, Alaska Population, and has proven effective in Alaska (U.S. Fish and Wildlife Service 1984). Dr. Dave Payer reviewed 10-15 yrs of survey data for six rivers in interior Alaska (Payer, pers. comm., 2002). In this review, survey data from either of two rivers selected by the Peregrine Falcon River Plan as index study areas (the upper Yukon and Tanana rivers) were shown to accurately represent survey data from all of the other rivers. The ability to make inference to the NCPN population

from index areas within an individual park is untested at this time. However, data from NCPN index study areas will be compared with regional trends assessed by the USFWS plan to determine this ability. It should be noted that the need to provide inference across the NCPN is not absolutely critical. This is because park units are included in the USFWS sample, and regional-trend analyses will result from this national effort.

Site Selection

Index study areas for NCPN parks will be selected after a review of historical data, and a discussion of feasible index areas (relative to access). Surveys will not be limited to known nesting territories; rather all potential nesting territories in the study area will be surveyed. This method incorporates an element of inventory into the monitoring plan. That is, investigators will stop every mile within suitable habitat and spend a minimum of 4 hours searching for evidence of occupancy by Peregrine Falcons.

Population being Monitored

Both the USFWS plan and this protocol call for monitoring Peregrine Falcons nesting in park units of the NCPN. Although some Peregrine Falcons winter in these units, it is not known if these same individuals breed in these units. Thus, surveys are limited to Peregrine Falcons nesting in NCPN park units.

Sampling Frequency and Replication

Sampling intensity of this NCPN protocol differs from the USFWS plan. Sites selected by the USFWS plan are monitored once every 3 years, over the course of a 13-year period (see USFWS plan Methods section C [Frequency and Duration of Sampling], section D [Sample Size]). This NCPN protocol recommends annual surveys, with a minimum of three visits per study area. Annual surveys provide more accurate data than the intermittent (once every three years) surveys required by the USFWS. The extent and intensiveness of annual surveys will ultimately depend on available funding. The number of known and potential territories to be surveyed in the NCPN will be determined after a thorough review of historical survey data. Specifically, historical variance in measures will dictate initial estimates of sample-size needs to achieve the sampling objectives. Over the course of long-term monitoring, power analysis of contemporary observations should be performed to determine necessary adjustments to sample sizes.

III. Field Methods

Field Season Preparations, Field Schedule, and Equipment Setup

Before beginning the field season, observers should review this entire protocol, including all of the SOPs, the American Peregrine Falcon Rocky Mountain/Southwest Region Population Recovery Plan (USFWS 1984), the USFWS Plan (Appendix A), Colorado Division of Wildlife Field Protocol (Appendix 4 of Craig and Enderson 2004), and the other references listed at the end of this document. The observer should pay special attention to the tasks described in SOP #1, Before the Field Season and SOP #2, Training Observers. Equipment and supplies listed in SOP #1 should be organized and made ready for the field season, and copies of the field data forms in SOP #5, Conducting the Peregrine Falcon Survey, should be made on acid-free, water-proof paper.

General sampling times and logistics should be organized prior to the start of each field season. However, flexibility is needed in scheduling sampling trips because of unpredictable weather.

Conducting the Survey

Detailed instructions on conducting the survey are provided in SOP #5. Surveys usually involve 2-4 visits to potential habitat or a known territory during the breeding season to ascertain territory status and productivity of active nests. Each visit may require up to 4 hours of observation to determine status of the territory. In most cases, activity such as a nest exchange, feeding, hunting, or flight will occur during a four-hour period. No loud, explosive devices should be used to flush birds from nests or perches; recorded vocalizations may be used to elicit responses from territorial birds. Conducting surveys during high winds or in heavy rains should be avoided as these conditions may hamper survey efforts.

Peregrine Falcon surveys can be accomplished with either one or two observers. Two observers are recommended, because observers can follow two different birds, one of which might go to the eyrie. All observers shall review appropriate literature on Peregrine Falcons, their behavior during the nesting season, and survey techniques.

Field notes and data forms are used during each visit to record falcon activity, which result in a seasonal summary of the status of the territory. In addition, photographs or sketches of the nest ledge are collected, UTM coordinates of the territory are determined (see SOP #3), and maps may be used to mark the location of important features of the site (see SOP #4).

NCPN park units are not in the region selected for contaminant monitoring. However, the region may be chosen by USFWS for contaminant monitoring in the future. As an anticipatory measure, the USFWS protocol for collection of samples for measuring contaminants in Peregrine Falcons is included as SOP #6.

At the end of the field season, equipment should be stored appropriately, summary information for each territory visited must be verified, and data and reports must be deposited or distributed to the USFWS coordinator, NCPN data manager, and the designated Principle Investigator (see SOP #9).

IV. Data Management

NCPN data-management procedures are detailed in SOP #7.

Overview of Database Design

Peregrine Falcon survey data are entered into a standardized database designed to accommodate all data noted on the Raptor Observation Record Card and the Raptor Eyrie Record Card. The database conforms to Natural Resource Database Template standards

established by the Inventory and Monitoring Program. The database accommodates data collected for existing territories as well as potential habitat, and allows the tracking of negative results if no birds are observed. The database provides tables for bird activity, nest location and description, and associated habitat. Users also enter details on photos taken, which allows automated linking of images (both photographs and scanned sketches of nest locations and birds) to the associated territory or site.

Each park unit participating in monitoring Peregrine Falcons maintains this database and provides an end-of-season copy of the verified and validated database, and electronic versions of any related images, to the NCPN Data Manager. Database copies are also maintained at the park level.

NCPN Inventory and Monitoring Data Manager
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Data fields in the NCPN database include monitoring data as required in the national USFWS monitoring plan, and these data will be provided to the USFWS regardless of whether the territories were included in the national random sample. A report form in the database will output data in the necessary format. USFWS Plan data forms for territories in the national random sample, as well as data from the Raptor Observation Record Cards for all other territories, should be sent to the following state contacts:

Zion N.P., Bryce Canyon N.P., Capitol Reef N.P.:
Southern Region Wildlife Manager, UDWR
Keith Day
1470 North Airport Road
Cedar City, UT 84720
435-865-6120

Canyonlands N.P., Natural Bridges N.M., Arches N.P.:
Southeastern Region Wildlife Manager, UDWR
Bill Bates
475 West Price River Dr, Ste C
Price, UT 84501
435-636-0262

Black Canyon of the Gunnison N.P., Colorado N.M., Curecanti N.R.A., Dinosaur N.M.:

State Cooperator – Colorado
Brent Bibles, Ph.D.
Colorado Division of Wildlife
317 W. Prospect Road
Fort Collins, Colorado 80526
970-472-4307 office
970-420-6215 cell
brent.bibles@state.co.us

Data Entry, Verification, and Editing

A user guide accompanies the database; however, the project leader makes certain that persons performing data entry understand how to use the database and follow the protocols. Quality control routines are built into the database to the maximum extent possible so that validation of certain data fields will occur at the time of data entry.

The primary goal of data entry is to transcribe the data from paper records into the computer with 100% accuracy. Data verification occurs immediately after data entry, when data printouts are compared against the original field forms and errors corrected immediately. While some data validation routines are automated to detect logic or range errors, a project specialist is also responsible for reviewing the data for content or context errors.

Metadata Procedures

Each table, field, query, form, and report in the database is defined and documented. In addition, information on data manipulations and the status of data verification and validation is recorded by the users in a data management log table.

Each park will complete and maintain an Inventory and Monitoring Dataset Catalog record for the project and the database, and will update the record contents annually. A copy of the updated record will be provided to NCPN.

Data Archiving Procedures

Digital data are archived in their native database format at the end of each field season after all data have been entered, verified, and validated. A complete copy of the database in its native database format is also archived whenever the database version changes. These version archives are supplemented by a platform-independent copy of the database files in ASCII format, which is created using the Access_to_ASCII utility developed and provided by NCPN. All archived files are designated as read-only.

All files, both active and archival, are required to be stored on a secure server or hard disk with regular backup routines that include an off-site storage rotation. CDs or DVDs are not considered acceptable for long-term archiving because of the potential for media failure.

Field forms and photographic prints or slides are irreplaceable resources that must be managed so that their quality and integrity are maintained long-term. Copies of these materials are used for project binders that are regularly used or referenced, while originals are accessioned into park archives for permanent storage and care.

V. Analysis and Reporting

NCPN Park Unit Analysis and Reporting

Annual Reports. Standard survey parameters should be reported following each field season. A report in standard NCPN scientific format, described in SOP #8, should be prepared, and include, at a minimum:

1. Number of occupied territories
2. Number of successful pairs
3. Number of fledglings per territorial pair
4. Number of fledglings per successful pair

Park units may use the following sections of the USFWS plan for parameter definitions, or as guidelines for the type of information to report (definitions are also provided as Attachments in SOP #5):

USFWS Plan, Methods Section A. Parameters and Definitions
USFWS Plan, Methods Section E. Analyses
USFWS Plan, Appendix F: Calculating Territory Occupancy and Nest Success

An electronic copy (on a CD) of the survey data, including territory summaries, digitized maps, photographs or sketches of nest sites should be included with the hard-copy of annual reports, maps, or sketches. The Principal Investigator is responsible for the safekeeping and organization of the data sheets, and ensuring that data are entered into the park unit database (see SOP #7 - Data Management) or that copies are sent to the appropriate state cooperator for the USFWS monitoring program, if appropriate. The Principal Investigator also should provide a copy of the report and associated data to the NCPN data manager for archiving.

Data Analysis. Analysis of Peregrine Falcon population trends should be conducted after 3-5 years of monitoring, and potentially every year thereafter. There are two options for analyses. Trends analyses may be conducted at the individual park unit if numbers of territories and observations are sufficient for a statistically meaningful assessment. It is most likely that limited sample sizes will require data to be combined from all park units for trend assessments. Also, the latter is more in-line with the regional-based

assessments by the USFWS. In both cases, trends in the three key parameters (territory occupancy, nest success, productivity) will be evaluated using standard regression methods (e.g., Nur et al. 1999), as described in SOP #8. For each parameter, trends will be determined by regressing the parameter values on time and determining the significance of the slope coefficient. Analyses of the data combined among park units may evaluate park-level trends or sub-regional trends (i.e., southern park units vs. northern park units) using dummy-variable analyses (Kleinbaum and Kupper 1978). The ability to perform such analyses will, of course, depend on overall sample size and the number of park units monitoring Peregrine Falcon. Bayesian analysis offers numerous advantages to frequentist approaches, especially where the lack of measurement precision detracts from deriving significant trends (Wade 2000). The utility of Bayesian analysis in trend assessments of the three monitored parameters for Peregrine Falcon is encouraged. Where applicable, Bayesian analysis will be standardized, as much as possible, and procedures will become part of this protocol (i.e., included in SOP #8).

A re-evaluation of sampling effort relative to the variability of parameter measures should be performed every 3-5 years using standard power-analysis methods. This ensures that sample-size needs are being met relative to the sampling objectives (stated above). The logic and utility of power analysis are summarized in Nur et al (1999). PC-based programs for conducting power analysis will be provided by the NCPN upon request.

Trend assessments at the park level should be included with the annual reports. The standard reporting format for analytical assessments should be followed. That is, reports should include a description of the analyses performed, and an interpretation and discussion of the results.

Trend assessments with data combined among park units will be conducted, upon request, by the NCPN Ecologist. A network-wide report will be produced that will include a summary of the data from participating park units, and interpreted results of trend assessments. Trend-assessment reports will be distributed to participating park units and the NCPN data manager for archiving.

USFWS Plan Analysis and Reporting

Data analysis and reporting of results will be conducted by the USFWS for territories sampled in the USFWS Plan. This will also include data from territories sampled outside of the USFWS Plan framework, when possible. Triennial reports will be issued by the USFWS. These triennial reports will include data summaries and analyses, suggestions for improvement of the sampling protocol or the plan, and an assessment of the need for possible re-listing. Reports will be posted on the world wide web, and available in printed form, by March of the year following surveys. Reports also may be produced between official sampling years.

VI. Personnel Requirements and Training

Project Implementation

The NCPN park unit requesting this protocol will designate a Principal Investigator (PI) as the lead on this protocol. The PI will be responsible for implementing the monitoring protocol, and will interface with NCPN Ecologist to insure that protocols are followed and survey data are managed appropriately. Observers will conduct the field work, and perform data entry, data management, analysis, and report writing. For trend assessments at the park level, either an observer or the PI should be responsible for data analysis and reporting. Network-wide trend assessments likely will be conducted by the NCPN Ecologist, who will be responsible for all aspects of analysis and reporting. The role of the USFWS National and Regional Coordinators of the Peregrine Falcon Monitoring plant is outlined in the Implementation Section of the USFWS Plan. Rob Hazlewood is the coordinator for the region that includes the NCPN; Michael Green is the National Coordinator (see below).

USFWS Region 6 Coordinator
Rob Hazlewood
USFWS, Ecological Services
Montana Field Office
100 North Park, Suite 320
Helena, Montana 59604
406-449-5225 ext.211
Fax 406-449-5339
Rob_Hazlewood@fws.gov

USFWS National Coordinator
Michael Green
Div. of Migratory Birds and State Programs
Pacific Region
911 NE 11th Ave
Portland, OR 97232
503-231-6164
Michael_Green@fws.gov

Qualifications and Training

The observer shall have a minimum of two field seasons of experience surveying Peregrine Falcons. Refer to SOP #2, Training Observers.

VII. Operational Requirements

Annual Workload and Field Schedule

Peregrine Falcon surveys in the NCPN will generally begin the last full week of March and extend to the first full week of August. This period coincides with the peak-breeding activity of the species in the NCPN, and includes occasional second clutches. Inclement weather will preclude the scheduling of site visits to specific annual dates. Monitoring efforts may require 2-4 visits/territory in a season (up to four hours per visit). Surveys can be accomplished by a single observer, although two observers are recommended for efficiency (Craig and Enderson 2004). Time required at each site per season can vary tremendously, depending on activity of the birds, from a few hours to a few days.

Time required for report generation will depend on amount of data and if a trend assessment is included. Annual summary reports should require 1-2 weeks of effort, or longer if it is a first-time report. Subsequent reports should take less time if they can capitalize on the background information and format of the initial report. Trend assessments will require more effort. The amount of time to conduct analyses will depend on the skill level of the analyst. At least 3-4 weeks should be allocated for this effort.

Facility and Equipment Needs

Office space with a computer will be needed, as well as equipment storage space. Table 1-1 in SOP #1, Before the Field Season, lists field equipment needs for a single observer. If two or more observers work simultaneously, equipment requirements will increase accordingly.

Startup Costs and Budget Considerations

Personnel expenses for field work are based on a single, seasonal biological science technician, surveying an established study area with multiple territories. The decision to survey in pairs or singly will depend on safety issues, available personnel, and funding. The cost of the survey will depend on the size of the survey area and the number of potential territories in the study area. Generally, one can expect to spend 2 days per season per potential territory. This estimate does not include any pre-season preparation, data analysis, data management, or report-writing time commitments. Because Peregrine Falcon monitoring has been ongoing in most NCPN park units, startup cost for equipment will be minimal (Table 1-1); they include the purchase of equipment and supplies listed in SOP #1, as well as maintenance and or replacement of equipment shared among multiple projects (e.g., GPS units, cameras).

Table 1-1. Estimated annual costs for monitoring Peregrine Falcons.

Estimated Costs (assume GS-7 or 9)	1 Observer	2 Observers
Field Work (Salary)	6000	12000*
Field Work (Travel)	2500	3000
Data Management/Reporting (Salary)	4000	4000
Startup Equipment Costs	1000	1500
Annual equipment/supplies	500	500
Total	14000	21000

* second observer may be a volunteer

Procedure for Making Changes to and Archiving Previous Versions of the Protocol

The rationale for dividing a sampling protocol into a Protocol Narrative with supporting SOPs is based on the following (from Peitz et al. 2002):

- The Protocol Narrative is a general overview of the protocol that gives the history and justification for doing the work and an overview of the sampling methods, but that does not provide all of the methodological details. The Protocol Narrative will only be revised if major changes are made to the protocol.
- The SOPs, in contrast, are very specific step-by-step instructions for performing a given task. They are expected to be revised more frequently than the protocol narrative.
- When a SOP is revised, in most cases, it is not necessary to revise the Protocol Narrative to reflect the specific changes made to the SOP.
- All versions of the Protocol Narrative and SOPs will be archived in a Protocol Library.

The steps for changing the protocol (either the Protocol Narrative or the SOPs) are outlined in SOP #10, Revising the Protocol Narrative and SOPs. The Protocol Narrative and all SOPs are labeled with version numbers, and include a Revision History Log. Changes to either document type are to be accompanied by changes in version numbers; version numbers and dates, the changes, reasons for the changes, and the author of the changes are to be recorded in the Revision History Log. The updated version numbers must be recorded in the Peregrine Falcon Master Version Table (see SOP #10) and conveyed to the Data Manger for proper updating of the master version table database. Older versions of the Protocol Narrative and SOPs must be archived in the NCPN Peregrine Falcon Protocol Library (X:\Archive\Monitoring_Archive\Peregrine_Falcon\Protocol_Library\).

VIII. References

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Appendix A

Monitoring Plan for the American Peregrine Falcon, A Species Recovered Under the Endangered Species Act (2003). U.S. Fish and Wildlife Service, Division of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, OR. 53 pp.

Appendix A is located on the NCPN web site at:

http://www.nature.nps.gov/im/units/ncpn/bib_library/peregrine/USFWS_2003_573851.pdf;

and on the World Wide Web at:

http://endangered.fws.gov/recovery/peregrine/plan2003.pdf.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 1

Before the Field Season

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) gives a brief description of preparation needs prior to field monitoring of Peregrine Falcons in park units of the Northern Colorado Plateau Network (NCPN). Prior to the field season each year, usually in early March, observers should review the complete protocol, including SOPs. Review of Peregrine Falcon identification by sight and sound, and knowledge of indicators of nesting behavior (SOP #2) are especially important. All observers should follow the outlined field schedule. All of the equipment and supplies listed in this SOP should be organized and made ready for the field season.

I. General Preparation And Review

Procedures:

<u>For territories sampled as part of the triennial USFWS Monitoring Program:</u>

1. Contact the USFWS Regional Coordinator for changes to the protocol. Specifically, you will need to determine:

    a. If a new random sample of territories has been selected to monitor, and which of these new sites, if any, occur within your park unit.
    b. If the Rocky Mountain Region will conduct contaminant monitoring during this sampling year (Regions selected for contaminant monitoring may change over the course of the 13-year monitoring period), and if so, whether NPS personnel will be expected to collect the samples.
    c. If there have been any other changes to the protocol.

For all known and potential territories in the study area:

1. Review appropriate references on Peregrine Falcons, their biology and behavior, and survey techniques for Peregrine Falcons.

2. Review available reports, notebooks, maps, and photographs from previous surveys to become familiar with known territories and ledges used.

3. Review and be familiar with all fields on the Raptor Observation Record Card (see SOP #5).

4. Review specific location information of all known Peregrine Falcon territories and associated nest sites. This information includes latitude and longitude or UTM coordinates, marked topographic quad maps, labeled photographs, sketches, or written directions. Specific territory location data should be available from individual park units; such information is not maintained by the USFWS.

5. Cade et al. (1996) includes photographs of known-aged Peregrine Falcon nestlings. This document can be purchased from:

   The Peregrine Fund
   5668 West Flying Hawk Lane
   Boise, Idaho 83709
   Ph. 208-362-3716, Fax 208-362-2376
   E-mail: mailto:tpf@peregrinefund.org

II. Scheduling Field Work

Procedures:

1. Peregrine Falcon breeding surveys will begin no sooner than the last full week of March and extend no later than the first full week of August, a period that includes the courtship through nestling phases of the breeding cycle, including the possibility of a second clutch should the first nest attempt fail. Inclement weather and slight variations in timing of breeding due to seasonal weather patterns will preclude the scheduling of surveys to specific annual dates. Sampling dates should be scheduled, and logistics organized prior to the start of each field season.

2. Monitoring efforts within park units will require, at a minimum, one experienced observer, making 3-4 visits to individual territories or to survey the study area over the course of the breeding season. Time required per potential and known territories will vary among territories. Work at some territories may be accomplished relatively quickly, while others may require most of a day per visit.

3. Field visits are scheduled to collect 3 main pieces of information: whether a territory is occupied, where the nest ledge is located so that nest status can be more accurately determined later, and whether (and how many if possible) young were successfully produced. Unless alternate methods are agreed upon, this is best accomplished by making three to four visits to known or potential nesting territories. Visits should be scheduled as follows: the first visit should occur after both adults have arrived on the territory and courtship display has begun; the second visit should be as soon as possible after the assumed date of clutch completion; the third visit should be when nestlings are between hatching and 32 days old (80% of fledging age).

The second and third visits are sometimes combined. The fourth visit is when nestlings are 32 days or more in age (and fledging success is assumed). In northern latitudes where the courtship period is minimal, only two visits are necessary.

III. Organizing Supplies and Equipment

Procedures:

1. Equipment should be organized and made ready several weeks before the field season. This allows time to make needed repairs and order equipment. Table 1-1 contains a list of field equipment needs for one observer. If two or more observers work simultaneously then equipment needs will change accordingly. Copies of the field data forms should be made on acid free, write-in-the-rain paper. All known, existing latitude/longitude or UTM coordinates for the territories to be surveyed should be entered into the GPS unit prior to the start of the field season (see SOP #3 for operation of GPS units).

Table 1-1. Field equipment list for Peregrine Falcon surveys.

Number Req.	Description
1	Field notebook
1	Photos of known-aged nestlings (Cade et al. 1996)
	Raptor Observation Record and Eyrie Cards, USFWS data form if needed (see SOP #5)
1	10X magnification binoculars[1]
1	High quality, portable spotting scope (15-40X zoom or 50x wide is most useful), $\geq$ 60mm objective lens preferable for better lighting[1]
1	Sturdy tripod which accepts interchangeable heads, preferably with "fluid" adjustment aids for tracking flying birds[1]
1	Rangefinder (1000 m range) for recording distance of observation post to nest
1	GPS unit (or UTM coordinates), maps, sketches, directions, or photographs for locating sites
1	Compass or topographic map for determining aspect of newly found nests
	Appropriate outdoor gear (hat, insect repellent, sunscreen, first aid kit, folding chair)

[1] Craig and Enderson (2004)

IV. Suggested Reference Manuals for Peregrine Falcon Surveys at NCPN Park Units

Cade, T.J., J.H. Enderson, and J. Linthicum. 1996. Guide to management of Peregrine Falcons at the eyrie. The Peregrine Fund, Boise, Idaho.

Craig, G.R., and J. Enderson, 2004. Peregrine Falcon Biology and Management in Colorado, 1973-2001. Colorado Division of Wildlife. Tech. Pub. #43. Fort Collins, CO.

Dunne, P. D. Sibley, and C. Sutton. 1988. Hawks in Flight. Houghton Mifflin Company, Boston. 254 pp.

National Geographic. 1987. Field Guide to Birds of North America, 3rd Edition. National Geographic, Washington, D.C. 480 pages.

Steenhof, K. 1987. Assessing Raptor Reproductive Success and Productivity. Pages 157-170 *in* B.A. Giron Pendleton, B.A. Millsap, K.W. Cline, and D.M. Bird, eds. Raptor management techniques manual. Nat'l. Wildl. Fed., Washington, D.C.

Stokes, D. W. and L. Q. Stokes. 1989. Stokes Nature Guides: A Guide to Bird Behavior. Volume 111. Little, Brown and Company, Boston. 397 pp.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). *In* The Birds of North America, Inc. Philadelphia, PA.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 2

Training Observers

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

POPULATION MONITORING

The USFWS Monitoring Plan for the American Peregrine Falcon states in its Methods, Section G. Monitoring Protocol, "Nest monitoring will be done… by observers familiar with Peregrine nesting behavior." The most essential component for the collection of credible, high-quality survey data is well-trained and experienced observers. Individuals who have demonstrated through experience, the ability to survey and work effectively with Peregrine Falcons, should be selected for survey work.

This Standard Operating Procedure (SOP) describes in more detail the skills needed to perform quality surveys, and offers references for gaining the background knowledge upon which these skills are based. The successful application of this knowledge comes with experience. For all of the following skills, inexperienced observers would benefit from spending time in the field with experienced Peregrine Falcon observers. This Northern Colorado Plateau Network (NCPN) protocol recommends that the main observer in these surveys have a minimum of two field seasons experience surveying for Peregrine Falcons. Additional training of other observers can be done in March at the outset of courtship to avoid interfering with the formal schedule of visits, or possibly during windows of opportunity throughout the field season.

I. Identification of Peregrine Falcons by Sight and Vocalization

Observers should be able to identify all raptor species in their area. In particular, Peregrine Falcons can be confused with the Prairie Falcon (*Falco mexicanus*) (similar shape and size), and a smaller falcon, the American Kestrel (*Falco sparverius*). Both of these species nest throughout Peregrine Falcon habitat on the Colorado Plateau. Individual Peregrine Falcons can occasionally be identified (although not positively) based on facial color pattern, noting details of the helmet pattern (placement of narrow or wide cheek stripes).

This can be a useful way of noting when replacement and probable interruption of the nesting sequence has occurred. Digital photographs taken with a spotting adapter provide good records of individual facial patterns.

Procedures:

1. Observers should read a number of references on raptor identification from sources such as Dunne et al. (1988) or Peterson's Hawk Identification (Clark and Wheeler 1998). General bird identification guides (National Geographic 1987; Robbins et al. 1983) are also useful in learning to identify this species.

2. Tapes or CDs of the vocalizations of Peregrine Falcons, prairie falcons, and American kestrels can be used to learn and distinguish vocalizations. Peregrine Falcons and prairie falcons, however, will be difficult to distinguish by vocalization alone.

3. Slides or photographs of Peregrine Falcons and similar raptors are useful learning tools.

4. Other suggested reference materials for raptor identification:

    - Tapes or CDs of bird songs are produced by Cornell Laboratory of Ornithology's Library of Natural Sounds, and may be obtained from State Wildlife Agencies.
    - National Audubon Society Interactive CD-ROM Guide to North American Birds. This interactive CD-ROM is an excellent resource for learning calls, site ID and background information on bird species. (http://www.avar.org/alted/cbsc_national_40_0855.html).
    - Bird slides of species likely to be encountered can be obtained from Cornell Laboratory of Ornithology. (http://www.birds.cornell.edu/Shop/VisualServices.html).

II. Identification of Behavioral Cues Indicating Breeding Stage for Peregrine Falcons

Each phase of the Peregrine Falcon breeding cycle can be distinguished by different adult behaviors. Identifying these behaviors correctly will be useful in determining the most efficient timing of visits, and therefore, the final territory status. Differences observed in vocalizations, aerial flight displays, destination of prey brought into the territory, and visibility of one or both members of a pair can be used to determine breeding stage. Observers will find good descriptions of Peregrine Falcon breeding behavior in Cade et al. (1996), Stokes and Stokes (1988), White et al. (2002), Palmer (1988), and Craig and Enderson (2004).

III. Aging and Sexing Adult and Subadult Peregrine Falcons

Aging and sexing adult and subadult Peregrine Falcons requires careful observation, knowledge of sex-specific behaviors, and experience. In general, observers should use "Unknown" for age and sex unless they are very confident of their determination. Useful

references on aging and sexing Peregrine Falcons include: Stokes and Stokes (1988), White et al. (2002), Palmer (1988), Cade et al. (1996).

Procedures:

1. Aging Peregrine Falcons: Peregrine Falcons do not reach full adulthood until their third year, until then they are called subadults. Occasionally, and rarely, one member of a pair will be a subadult, so it is important, when possible, to ascertain age. Subtle plumage characteristics and foot and cere coloration are the best means to distinguish between these two ages. Observers should read the cited references for detailed descriptions of plumage, cere and foot characteristics by age.

2. Sexing Peregrine Falcons: The female Peregrine Falcon is larger in size than the male by about one-third. This size difference is apparent when both birds are observed together in flight, but is often difficult to note when the birds are not together. Behavior at the nest will be the best way to distinguish sex in adult Peregrine Falcons, as all but the most experienced observers will find it difficult to identify the sex of a lone peregrine away from the nest. Observers should read the cited references for detailed descriptions of the difference between sexes in Peregrine Falcons.

IV. Locating the Active Nest

In the Southwestern United States, Peregrine Falcons typically nest in natural cavities (potholes) and ledges on cliff faces. Deeper potholes or cavities are used in hotter locations to provide shade. There are two steps to identifying the active nest site (i.e., cavity or ledge where eggs are laid). Initially, the territory is surveyed to find which cliff face is being used in the current year, usually during the first visit. This first visit determines territory occupancy. The next step is to pinpoint the exact nest site on the cliff face. This is usually determined during the incubation or nestling phases by sightings of the Peregrine Falcon entering the nest. These detections occur during subsequent visits. During the early visits, the location of fresh Peregrine Falcon whitewash (feces) can provide clues to help focus observation on specific areas of a cliff when presence, absence, or specific area of use has not been determined yet.

Procedures:

1. Observers should review photographs of previously used Peregrine Falcon nest ledges, well-used perches, as well as those of other raptor species known to nest in the area. The concentration of whitewash will differ between well-used perches and the active nest site. Active Peregrine Falcon nest ledges rarely have a lot of whitewash, if any, early in the nesting season, but can sometimes be identified by a few single, long streaks of whitewash. Well-used perches, in contrast, are thick with whitewash. Note that whitewash from previous years will take on a yellowish hue.

2. Before the start of field season, observers can be taken to Peregrine Falcon and other raptor nest sites occupied during the past season to develop their skills.

3. If an experienced observer is paired with an inexperienced observer, this kind of field knowledge can be transferred through the course of the field season.

CONTAMINANTS MONITORING

The USFWS Monitoring Plan for the American Peregrine Falcon focuses on population monitoring, with a secondary emphasis on contaminant monitoring in a subset of the Recovery Regions. Although the USFWS Plan outlines the protocol for contaminant monitoring, provided in SOP #6, training of investigators is not addressed. Training for contaminant monitoring involves obtaining permits, and competency in the more complicated procedure of entering nests to band nestlings, collecting addled eggs and collecting feather samples. At this time, no NCPN park units are required to do contaminant monitoring, and future needs for this kind of data are typically met by teams from outside agencies. Therefore, training for contaminant monitoring is not addressed in this SOP.

V. References

Cade, T. J., J. H. Enderson, and J. Linthicum. 1996. Guide to management of Peregrine Falcons at the eyrie. The Peregrine Fund, Boise, Idaho

Clark, W. S., and B. K.Wheeler. 1998. Field Guide to Hawks: North America (Peterson Field Guides). Houghton Mifflin Company, Boston. 198 pp.

Craig, G. R., and J. H. Enderson. 2004. Peregrine Falcon biology and management in Colorado 1973-2001. Colorado Division of Wildlife Technical Publication N. 43, Fort Collins, CO.

Dunne, P., D. Sibley, and C. Sutton. 1988. Hawks in Flight. Houghton Mifflin Company, Boston. 254 pp.

National Geographic. 1987. Field Guide to Birds of North America, 3rd Edition. National Geographic, Washington, D.C. 480 pp.

Palmer, Ralph S. ed. 1988. Handbook of North American Birds. Volume 5. Diurnal Raptors (Part 2). Yale University Press, New Haven and London. 465 pp.

Robbins, C. S., B. Bruun, and H. S. Zim. 1983. Golden: A Guide to Field Identification of North American Birds. Western Publishing Company, Inc., Racine, WI. 360 pages.

Stokes, D. W. and L. Q. Stokes. 1988. Stokes Nature Guides: A Guide to Bird Behavior. Volume 111. Little, Brown and Company, Boston, MA. 397 pp.

White, C.M., N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). *In* The Birds of North America, No. 660. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 3

Using Global Positioning System (GPS) Units

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) explains the procedures and considerations that all observers should follow when collecting geospatial data or navigating to locations. This SOP is written for recreational-grade GPS units such as those manufactured by Garmin or Magellan. These units are far less expensive than mapping-grade units (e.g., Trimble GeoExplorer), yet they are effective for obtaining point information at a level of spatial accuracy that is required for this project. Recreational-grade GPS units do not have the capability of a data dictionary for storing attribute information with point locations.

This SOP assumes that each observer is familiar with the operation and function of the GPS unit to be used for this project. This SOP is intended to complement, not replace, the operations manual accompanying the GPS unit. Each observer should be familiar with the use of their particular GPS unit before entering the field to collect data or navigate to points.

This SOP does not require the use of a specific type or brand of GPS unit; however, the unit is required to meet the minimum standards listed below. The Northern Colorado Plateau Network (NCPN) primarily has used Garmin units, specifically, the eTrex, III Plus, and 76 models. The procedures below provide project-specific guidelines that are applicable to any recreation-grade unit. Attachment A contains detailed instructions relating to the operation of the Garmin 76 model. GPS functions other than those associated with this protocol are not explained in this document.

Procedures:

1. The minimum GPS receiver standards for navigating and mapping are:

- Capable of storing date, time, and coordinates of features collected.
- Capable of exporting features collected to a format that can be used by GIS
- Capable of maintaining an EHE (Estimate of Horizontal Error) of less than or equal to 12 meters. Maintaining an EHE (or EPE – Estimate of Positional Error) of 12 meters or less meets the National Map Accuracy Standard.
- Capable of tracking a minimum of 4 satellites
- Capable of collecting real-time differentially-corrected positions (DGPS)

2. Required equipment

- GPS unit
- One set of extra batteries
- Operation manual
- Compass
- Rangefinder
- USGS 1:24,000-scale topographic map
- Personal computer for downloading data from the GPS unit. DNR Garmin (freeware, available at http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions.html) should be installed on the computer to facilitate the data download.

3. GPS Unit Setup before leaving the office (see Attachment A).

- Set GPS unit standards

Minimum GPS Receiver Settings Standards

Name	Standard
Projection (displayed coordinates)	UTM
Datum	NAD 83
WAAS	Enabled (on)

- Upload background data (MapSource)
- Upload existing waypoints to the GPS unit (if necessary)

4. Navigation to an existing location

If an existing Peregrine Falcon observation point is to be revisited, the observer can relocate that point using the GPS unit. Navigation to the point is best accomplished by using background maps that have been loaded onto the GPS unit, in addition to using hard-copy USGS 1:24,000-scale topographic maps.

- Select the waypoint you wish to navigate towards and follow the pointer displayed on the unit.
- In order to navigate, the GPS unit must be moving

5. Collecting new location data

The observation point providing the best direct line of site to a nest must be recorded. This waypoint is documented by recording UTM and Lat/Long coordinates. Also, the bearing and distance to the nest site from this point is recorded.

- Take (or mark) a waypoint, and identify it with a unique ID that matches the location identifier recorded on the field sheet. This ID will have a 3 digit nest territory number and a one letter site number; e.g., 002A identifies the observation location in territory 002, nest site A. The ID for a new nest site this territory in a subsequent year would be 002B. Space permitting, the NCPN recommends adding a GPS unit ID number to the end of the waypoint ID (002A3 would indicate GPS unit "3" was used to mark the location).
- Record waypoint UTM coordinates that are displayed on the GPS unit on field sheet.
- Use compass to determine bearing to nest site and record on field sheet.
- Record approximate distance from observation point to nest site. Use rangefinder, or, if out of range, determine distance using topographic map.

6. Downloading Data from GPS unit (see Attachment A)

The data from the GPS unit are downloaded to a personal computer daily, or after each field stint. Frequent, regular downloads will safeguard against any loss of data.

NCPN recommends the use of the DNR Garmin extension. This tool facilitates the communication between ArcView and Garmin Brand GPS units by allowing users to download and upload waypoints (and tracks) as text files, shapefiles and/or graphics. DNR Garmin is freeware, and is available at http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions.html)

- Connect the GPS unit to the personal computer using a USB or serial cable.
- Download GPS data (.txt files) into appropriate folders (Figure 3-1). Fields required from a unit download are: ident (waypoint), lat, long, y_proj, x_proj, comment, altitude, and model.
- Review the downloaded data for accuracy and completeness.

Text files are required as part of the download. GIS shapefiles can be created at the same time. See Attachment A for additional information on shapefile creation. NCPN recommends that during the field season, downloads be limited to text files with a single set of GIS shapefiles created at the conclusion of the field season.

Downloaded GPS text files will be appended to the Peregrine Falcon database at the time of data entry (see SOP #7).

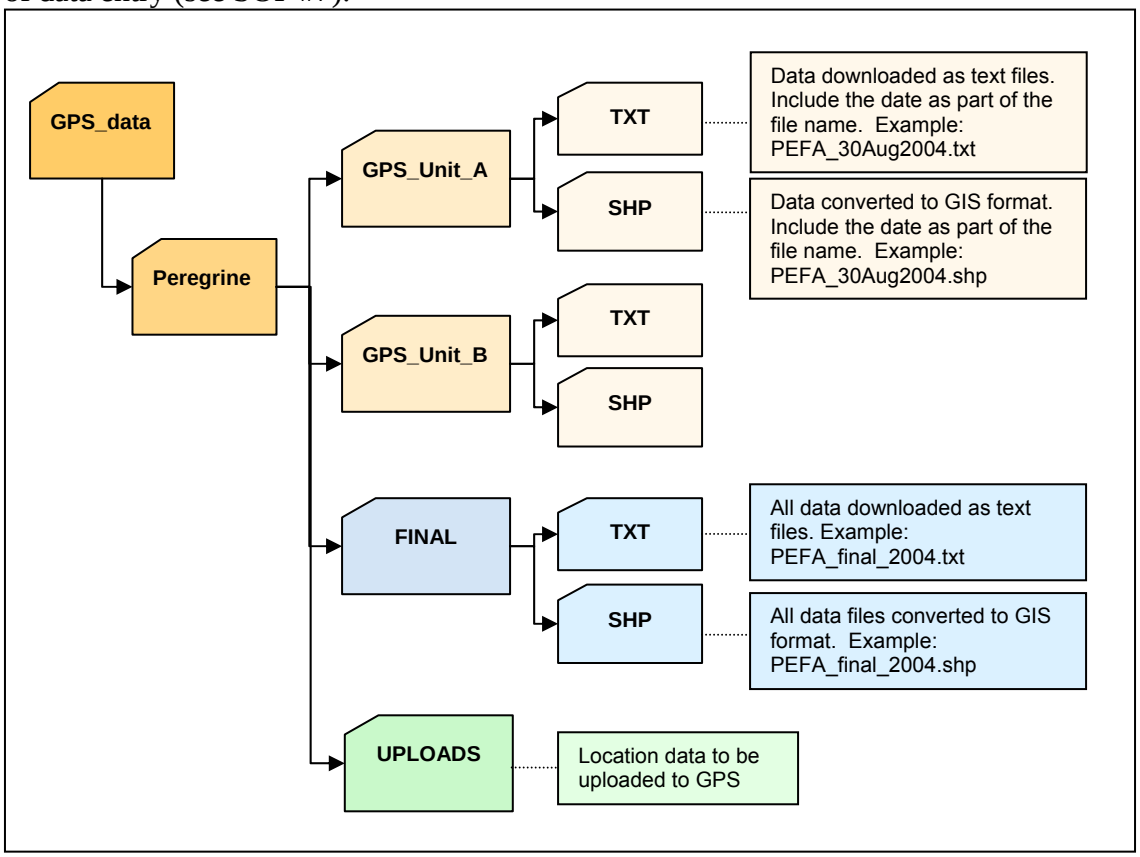


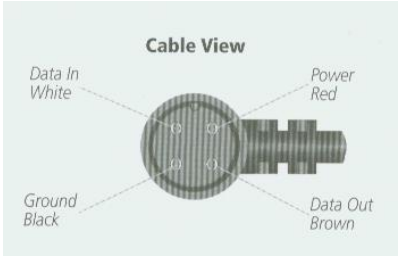
Figure 3-1. Recommended directory structure for data downloaded from GPS unit.

Attachment A

This graphic demonstrates the keys of a Garmin 76 GPS unit, and their functions. These keys are referred to in the following instructions.

1. To Connect GPS to Computer

- Either a serial or USB port cable will accompany the GPS unit. This is the cable that connects the GPS receiver to your workstation computer, allowing the uploading and downloading of waypoints.
- The serial or USB end of the cable attaches to your workstation computer. The other cable end (below) inserts into the Garmin GPS unit (lift bottom of black flap on the back of the GPS unit)



2. To change the displayed map projection:

- Turn on the unit by depressing the POWER key
- Set Projection
    1. Access the Main Menu (press the MENU key twice)
    2. Using the rocker key, scroll down to Setup and press the ENTER key
    3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to Location Format and press the ENTER key.
    4. Scroll down the list of formats to UTM UPS, make sure this choice is highlighted, and press the ENTER key.
    5. Scroll down to Map Datum, press the ENTER key. Scroll down through the Map Datum choices, press the ENTER key when NAD 83 is highlighted.
    6. Press the PAGE key to get back to the "GPS Information" screen. (If the GPS Information screen is not showing, press the PAGE key; it will cycle through the screens). The bottom of the screen should now be displaying coordinates as UTM.

3. Set GPS to log differentially correct data

- If not already on, power up the GPS
- Enable WAAS
    1. Access the Main Menu (press the MENU key twice)
    2. Using the key, scroll down to Setup and press the ENTER key
    3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to General and press the ENTER key.
    4. Scroll down to WAAS, press ENTER, highlight Enabled, and press ENTER
    5. Press the PAGE key to exit Setup

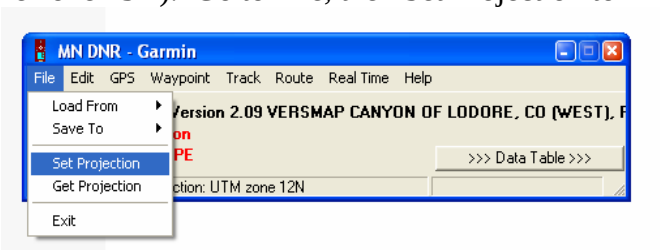
4. In the Field

- Collect (or mark) a waypoint
    1. When at the observation location, check the GPS Information page for number of satellites (4 or more needed) and accuracy (12 meters or less)
    2. Press and hold the ENTER/MARK key until the Mark Waypoint Page is displayed.
    3. Using the Rocker key, change the waypoint ID to Nest Territory number plus site letter (GPS number optional).
    4. Using the Rocker key, highlight "OK" and press ENTER
- Navigation
    1. Press the NAV key
    2. Select 'Go To Point' then press the ENTER key
    3. Select 'Waypoints' then press the ENTER key
    4. Select 'your point' then press the ENTER key

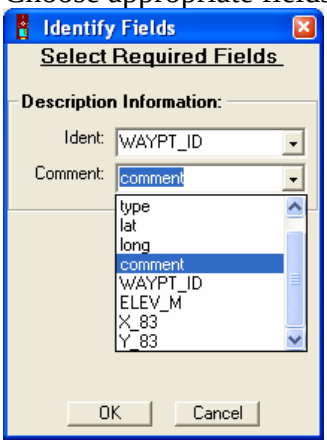
5. Highlight the 'GoTo' button, press ENTER
6. As you start walking, the Pointer will point to your destination

5. Upload Background Data

- Upload background maps from MapSource (proprietary software) if needed
- Upload waypoints using DNR Garmin
    1. Connect GPS to the computer
    2. Turn GPS on, then open DNR Garmin, it will connect to the computer
    3. When the MN DNR – Garmin window opens, make sure that the projection is set to UTM, NAD 83, zone 12N (unless at CURE or BLCA, which are zone 13N). Go to File, then Set Projection to change projection.

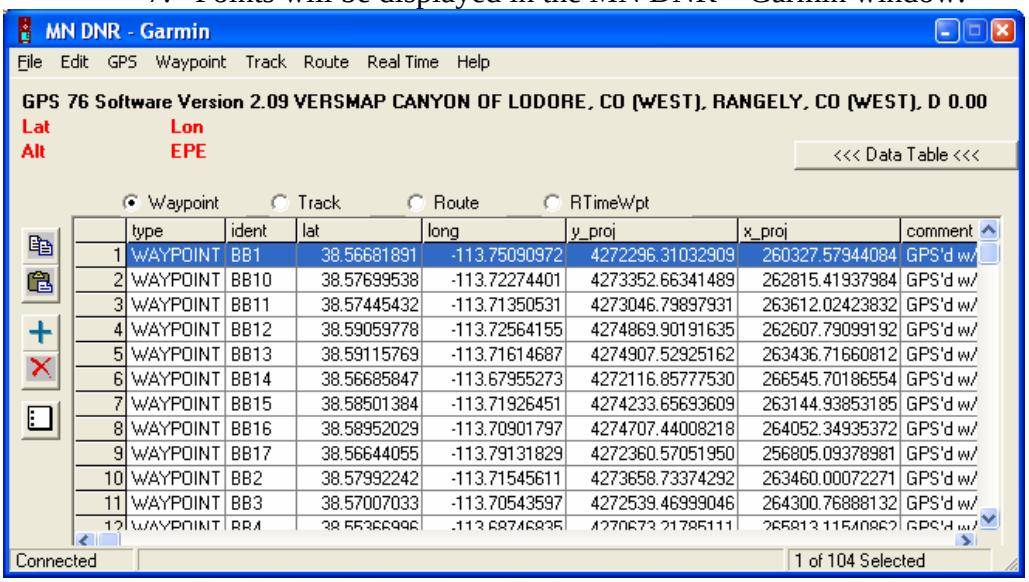


    4. Click on File, then Load From. You can upload a .txt file, .dbf file or a shapefile. Navigate to the file you wish to upload and click Open.
    5. A window will open prompting you select description information. Choose appropriate fields for Ident (ID) and Comment and click OK.



    6. A window will open stating "File was loaded successfully from….", click OK

7. Points will be displayed in the MN DNR – Garmin window.

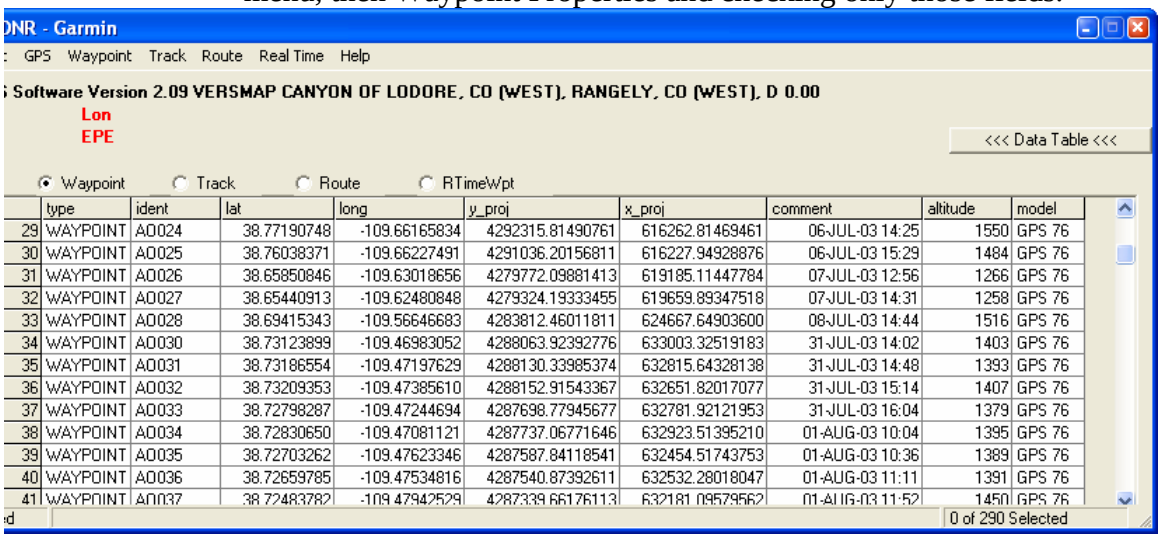


	type	ident	lat	long	y_proj	x_proj	comment
1	WAYPOINT	BB1	38.56681891	-113.75090972	4272296.31032909	260327.57944084	GPS'd w/
2	WAYPOINT	BB10	38.57699538	-113.72274401	4273352.66341489	262815.41937984	GPS'd w/
3	WAYPOINT	BB11	38.57445432	-113.71350531	4273046.79897931	263612.02423832	GPS'd w/
4	WAYPOINT	BB12	38.59059778	-113.72564155	4274869.90191635	262607.79099192	GPS'd w/
5	WAYPOINT	BB13	38.59115769	-113.71614687	4274907.52925162	263436.71660812	GPS'd w/
6	WAYPOINT	BB14	38.56685847	-113.67955273	4272116.85777530	266545.70186554	GPS'd w/
7	WAYPOINT	BB15	38.58501384	-113.71926451	4274233.65693609	263144.93853185	GPS'd w/
8	WAYPOINT	BB16	38.58952029	-113.70901797	4274707.44008218	264052.34935372	GPS'd w/
9	WAYPOINT	BB17	38.56644055	-113.79131829	4272360.57051950	256805.09378981	GPS'd w/
10	WAYPOINT	BB2	38.57992242	-113.71545611	4273658.73374292	263460.00072271	GPS'd w/
11	WAYPOINT	BB3	38.57007033	-113.70543597	4272539.46999046	264300.76888132	GPS'd w/
12	WAYPOINT	BB4	38.55366996	-113.69746835	4270673.21785111	265813.11540862	GPS'd w/

8. If the points are correct, click on WAYPOINT, then Upload
9. A window will pop up stating "Transfer Complete. # points uploaded"

6. Downloading Waypoints

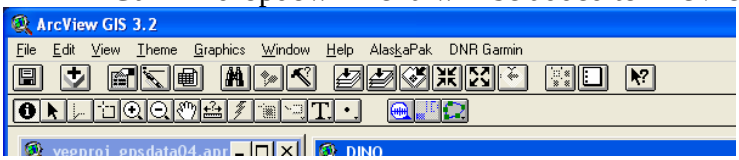
- Download waypoints using MN DNR Garmin freeware
  1. Connect the GPS to the computer and turn on the GPS unit, then open the program DNR Garmin on the computer
  2. From the DNR Garmin main menu, click on Waypoint, then Download. Your data will appear in the MN DNR Garmin window (see below). Elements to be included in the downloading process are: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. These fields can be chosen by choosing Waypoint from the main menu, then Waypoint Properties and checking only those fields.



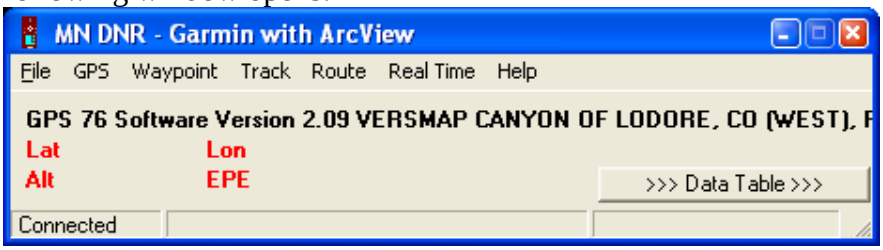
	type	ident	lat	long	y_proj	x_proj	comment	altitude	model
29	WAYPOINT	A0024	38.77190748	-109.66165834	4292315.81490761	616262.81469461	06-JUL-03 14:25	1550	GPS 76
30	WAYPOINT	A0025	38.76038371	-109.66227491	4291036.20156811	616227.94928876	06-JUL-03 15:29	1484	GPS 76
31	WAYPOINT	A0026	38.65850846	-109.63018656	4279772.09881413	619185.11447784	07-JUL-03 12:56	1266	GPS 76
32	WAYPOINT	A0027	38.65440913	-109.62480848	4279324.19333455	619659.89347518	07-JUL-03 14:31	1258	GPS 76
33	WAYPOINT	A0028	38.69415343	-109.56646683	4283812.46011811	624667.64903600	08-JUL-03 14:44	1516	GPS 76
34	WAYPOINT	A0030	38.73123899	-109.46983052	4288063.92392776	633003.32519183	31-JUL-03 14:02	1403	GPS 76
35	WAYPOINT	A0031	38.73186554	-109.47197629	4288130.33985374	632815.64328138	31-JUL-03 14:48	1393	GPS 76
36	WAYPOINT	A0032	38.73209353	-109.47385610	4288152.91543367	632651.82017077	31-JUL-03 15:14	1407	GPS 76
37	WAYPOINT	A0033	38.72798287	-109.47244694	4287698.77945677	632781.92121953	31-JUL-03 16:04	1379	GPS 76
38	WAYPOINT	A0034	38.72830650	-109.47081121	4287737.06771646	632923.51395210	01-AUG-03 10:04	1395	GPS 76
39	WAYPOINT	A0035	38.72703262	-109.47623346	4287587.84118541	632454.51743753	01-AUG-03 10:36	1389	GPS 76
40	WAYPOINT	A0036	38.72659785	-109.47534816	4287540.87392611	632532.28018047	01-AUG-03 11:11	1391	GPS 76
41	WAYPOINT	A0037	38.72483782	-109.47942529	4287339.66176113	632181.09579562	01-AUG-03 11:52	1450	GPS 76

3. Click on File, and then Save To. Navigate to the proper folder on the computer (see possible directory structure, Figure 3-1)
4. There are several file types which you can save the file as. The NCPN recommends saving the data as a Text File (Comma delimited)(*.txt) file. This is the default choice.
5. Name the file with the date of download in the file name (example: Peregrine_June10_05.txt) and click the Save button. A window will display "File successfully written to …"

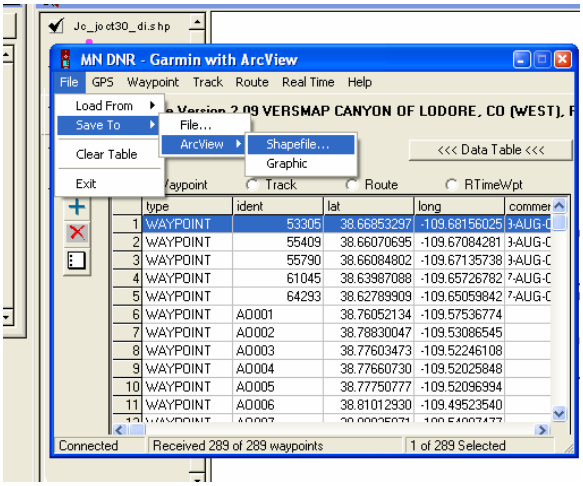
- Download waypoints using MN DNR Garmin and ArcView 3.x
  1. Connect GPS unit to workstation
  2. Open and activate the DNR Garmin-ArcView extension in ArcView. A DNR Garmin dropdown menu will be added to ArcView.



  3. From the DNR Garmin menu, choose "Set Projection". Choose UTM NAD83, and the appropriate zone (12 for all NCPN parks except CURE and BLCA which are 13)
  4. From the DNR Garmin menu, choose "Open Garmin GPS". The following window opens:



  5. From this window, click on Waypoint, then Properties. Choose (check) the following fields: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. Click OK to dismiss the Properties window
  6. Click on Waypoint, and then Download. All points collected will be downloaded.
  7. Click on File, and then Save To, then ArcView, then Shapefile.



8. Navigate to the appropriate folder, and click Save. The newly created shapefile will appear in the active ArcView view window. Notice that X & Y coordinates have been added to the shapefile.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 4

Documenting Territory and Nest Site Location

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) describes the procedures to: (1) locate a Peregrine Falcon territory to be surveyed; and (2) document new territories or nest ledges (nest sites) within a known territory. These procedures are part of the protocol for monitoring Peregrine Falcons in the Northern Colorado Plateau Network (NCPN) park units.

I. Locating and Documenting Peregrine Territories

Raptors often use alternate nest sites within the same territory from year to year. Careful documentation of the general territory location, as well as alternate nest sites used in the past, can minimize the time and difficulty sometimes associated with locating nest sites.

Procedures:

1. The back side of the Raptor Observation Record Card (Raptor Eyrie Record Card) contains fields for describing the physical characteristics of the nest territory and specific nest site (see SOP #5). These fields should be completed for all newly-discovered nest sites.

2. Territories not already described by Universal Transverse Mercator (UTM) coordinates coordinates based on GPS technology should have UTM coordinates collected following SOP #3. All known, existing UTM coordinates for the territories to be surveyed should be entered into the GPS unit prior to the start of the field season. GPS units can then be used to navigate to territories if needed (see SOP #3).

3. Because of potential error associated with UTM coordinates, other descriptions of nest site locations should be included. A specific description of the nest sites based on a local landmark, such as one noted on a map, should be prepared. E.g., “North

side of Colorado River, 2.2 km west of junction of Colorado and Green rivers." Other methods to document territory and nest ledge locations include:

- Marked 7.5 minute topographical maps
- Sketches of nest ledge locations, preferably including the cliff skyline, important perches, and prey caches.
- Photographs showing the alternate nest ledges used within a territory over time can be helpful when trying to find the specific nest site. The Colorado Division of Wildlife (Craig and Enderson 2004) took photographs of nest sites at three scales: distant view of the cliff, normal view from observation point, and when possible, a close-up telephoto image of the nest ledge. Slides, glossy prints, or high-quality (5-6 mega pixel range) digital photographs provide resolution necessary to enlarge photos for nest ledge details. Photographs should be thoroughly labeled with territory label, alternate nest site label, general location, and year, at a minimum. Photographs should be stored at the park in archival quality plastic photograph sleeves in a binder; photographs should also be digitized and stored on a hard drive or server that is regularly backed up. Additional details on managing photos are presented in SOP #7.

II. References

Craig, G.R., and J.H. Enderson. 2004. Peregrine Falcon biology and management in Colorado 1973-2001. Colorado Division of Wildlife Technical Publication N. 43, Fort Collins, CO

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 5

Conducting the Peregrine Falcon Survey

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) describes the procedures for conducting Peregrine Falcon breeding season surveys in Northern Colorado Plateau Network (NCPN) park units. Methods for surveys described in this SOP provide more detailed information than those outlined in the nation-wide *Monitoring Plan for the American Peregrine Falcon* (USFWS 2003). The SOP specifically describes the procedure for collecting data and filling in both USFWS and NPS observation forms.

I. General Survey Guidelines

To minimize disturbance to nesting Peregrine Falcons and to standardize survey methods, note the following guidelines:

1. Falcons can be active during all daylight hours. Optimal times to survey are likely dictated by both best viewing conditions and expected activity of the birds.

2. Acceptable weather conditions are where wind, rain, or sun conditions do not interfere with a surveyor's ability to see and hear falcons.

3. It is very important to avoid disturbing nesting Peregrine Falcons. No loud, explosive devices should be used to flush perched birds or birds at eyries. Only limited playback of common vocalizations is acceptable to elicit a response from territorial birds.

4. Unless nest site visits are specifically needed and authorized, investigators should approach nest sites no closer than is essential to accomplish survey objectives. To avoid egg and nestling mortality or abandonment by adults, disturbances which cause adult birds to leave the nest must be of short duration.

II. Specific Field Protocol - Surveying Known Territories

1. Prior to the day of the survey, assemble equipment (SOP #1) and acquire the coordinates of known and potential nest territory locations. Coordinates can be uploaded into a GPS for navigation purposes (see SOP #3). Observers should be familiar with the report forms (Attachments A, B, G), instructions for filling out forms (Attachments C, D), and raptor observation and breeding status terminology (Attachments E, F).

2. Observers should approach the territory from the direction that affords the best possible view of the cliff face. Sometimes it is possible to observe from the top of an opposing cliff, as in a canyon situation. The observation point may move over the course of the visit, but in general should be far enough from the nest to avoid soliciting a sustained territorial behavior from either adult. A distance of 150-1700 m is recommended by USFWS (2003). If possible, observers should avoid being farther than ~800 m from the cliff face because they will have difficulty seeing falcon activity.

3. A pair of observers may stay together, or split up if required to look for evidence of occupancy along an extended cliff face. Craig and Enderson (2004) provide an excellent discussion of how a pair of observers can work together most efficiently.

4. A minimum of four hours should be spent at each known and potential nest territory unless falcons are present and territory status can be determined sooner. Four hours is normally the maximum time between eyrie visits/exchanges at the ledge, hence it may take this long to observe activity at the territory. Normally, less time is needed. For all potential nesting habitat in areas of nearly continuous potential habitat (such as in canyon country), observers will stop about every mile and spend a minimum of 4 hours watching for falcon activity. If the area is occupied by Peregrine Falcons, territory status can often be determined in less than 4 hours.

5. Time should be noted at the start of the observation period. Pertinent field notes and the visit summary can be recorded directly onto the Raptor Observation Record Card (Attachment A), as well as the USFWS data form if the territory is included in their national sample (Attachment G). The Remarks section of the Raptor Observation Record Card can be used for any information that helps to support a seasonal summary of the territory, including expanding upon Activity or Behavior noted in the section above it, or describing unique features of the birds. One Raptor Observation Record Card is intended to contain all the monitoring data needed to describe an active Peregrine Falcon territory for the whole season, including multiple visits, and supplemented by sketches, photographs, or maps if available, which are later attached to the Card. However, in a field notebook, observers may find it useful to make a detailed record of all falcon behavior, as they observe it, in order to be confident about their interpretation of territory status. Table 5-1 shows the kind of information that is useful to record both in field notes, or in the Remarks

section of the Raptor Observation Record Card, as supporting evidence of territory status. Only the notes recorded on the Record Card will be maintained in the database with the season summary for each territory.

Table 5-1. Suggested content of supporting evidence of territory status recorded in the field and on the Raptor Observation Record Card.

FIELD NOTEBOOK	RAPTOR OBSERVATION RECORD CARD
Example: 25 Apr 2000 0800 begin observation 0900 adult (ad) flies into area, wailing and with prey, perches on cliff 0902 ad flies out of cavity, takes prey from other ad, and flies off down canyon (this is the female) out of sight 0904 ♂ad enters cavity 0915 ad ♀ returns to area and flies back into cavity, no prey, ♂exits and flies out of sight *etc…*	REMARKS section: • unusual plumage – unique helmet pattern or evidence of subadult age • prey exchange or cache noted • specific type of vocalizations • extreme weather events • interactions with other cliff-nesting species • unusual behavior – courtship or copulation late in the season • band info should be recorded here and on the back of the card

6. Once the status of the territory is determined, or at least 4 hours have passed, observers can move on to the next known or potential territory if time allows. For new nest ledges, either in known or newly found territories, observers should do the following (see SOP #4 - Documenting Territory and Nest Site Location):
    - Take a photograph (preferably digital with 5-6 megapixel resolution) or make a sketch of the nest ledge
    - Mark the location of the nest site on a quad map
    - Collect UTM coordinates of the observation point using a GPS unit, as well as, distance and bearing to nest
    - Fill in the Raptor Eyrie Record Card (reverse of Raptor Observation Record Card – see Attachment B) following instructions in Attachment D.

7. One Raptor Observation Record Card (Attachment A) will be completed for each known or potential territory visited. For potential habitat surveyed, there will be no nest territory number to record in the appropriate box of the Raptor Observation Record Card. Instead, "Survey of Potential Habitat" should be recorded in its place. Even if no Peregrine Falcons are detected during a particular visit, this information should be recorded.

8. Occupied territories of other raptor species should be recorded on a separate Raptor Observation Record Card.

9. Before leaving the field each day, check data sheets for completeness and readability. All information pertinent to the sites sampled that day should be recorded. The Principal Investigator is responsible for the safekeeping and organization of the data sheets, and ensuring that data are entered into the park unit database (see SOP #7 - Data Management) or that copies are sent to the appropriate state cooperator for the USFWS monitoring program, if appropriate.

III. References and Suggested Readings

Cade, T. J., J. H. Enderson, and J. Linthicum. 1996. Guide to management of Peregrine Falcons at the eyrie. The Peregrine Fund. Boise, ID. 97 pp.

Craig, G.R., and J.H. Enderson. 2004. Peregrine Falcon biology and management in Colorado 1973-2001. Colorado Division of Wildlife Technical Publication N. 43, Fort Collins, CO

U.S. Fish and Wildlife Service. 2003. Monitoring Plan for the American Peregrine Falcon, A Species Recovered Under the Endangered Species Act. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, OR. 53 pp.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). *In* The Birds of North America, Inc. Philadelphia, PA.

Attachment A. Raptor Observation Record Card.

RAPTOR OBSERVATION RECORD CARD (FEB 1989)

OBSERVER NAME AND ADDRESS:	MAP NAME:
	MAP # - NEST TERR. # - SITE # - YEAR
SPECIFIC AREA (DESCRIBE):	OTHER NO. (e.g. Agency No.):
	UTM-N or LATITUDE of nest location:
	UTM-E or LONGITUDE of nest location:

SPECIES (COM NAME OR AOU ABBREV.):

DATE	TIME	SUR MET	NO. ADS	NO. SUB	NO. EGGS	NO. NEST	AGE NEST	NO. FL	ACTIVITIES
					E A	E A	E A		
					E A	E A	E A		
					E A	E A	E A		
					E A	E A	E A		
SEASON SUMMARY	TOTAL:								

SURVEY METHOD:
1. FOOT
2. VEHICLE
3. BOAT
4. PLANE
5. HELICOPTER
6. INCIDENTAL OBS.

ACTIVITY / BEHAVIOR (May Be More Than One)

1. PERCHED	7. BODY CARE	13. COPULATING
2. FLYING	8. COURTSHIP	14. OTHER:
3. HUNTING/FORAGING	9. NEST BUILDING	
4. FEEDING ADULT	10. INCUBATING	
5. TERR. DEFENSE	11. BROODING	
6. VOCALIZING	12. FEEDING YOUNG	

OFFICIAL NEST STATUS NOTES, MAP, OR PHOTO ATTACHED? 1.YES 2. NO

UTM-N or LATITUDE of observation point: UTM-E or LONGITUDE of observation point:	DISTANCE from observation pt. to nest (m): BEARING from observation pt. to nest (deg):

REMARKS (Molt In Adult Pair, Prey In Nest/Eyrie, Etc.):

Attachment B. Raptor nest/eyrie record card (reverse side of Attachment A).

RAPTOR NEST/EYRIE RECORD CARD (FEB 1989)

TREE NEST-SPECIES: 1. LIVE TREE 4. ARTIFICIAL 2. SNAG 5. CAVITY IN TREE 3. NEST BOX/PLATFORM 6. OTHER	GROUND NEST - SITUATION: 1. LEDGE ON CLIFF 4. OPEN HILLSIDE 2. STICKNEST ON CLIFF 5. LEVEL GROUND 3. CAVITY (POTHOLE) ON CLIFF 6. OTHER
	CLIFF ROCK TYPE: 1. SED 2. IGN 3. MET SPEC. FORMATION:
TREE HEIGHT (M): E A	
TREE DIAMETER (CM): E A	CLIFF HEIGHT (M): E A
HEIGHT OF NEST IN TREE (M): E A	CLIFF LENGTH (KM): E A
DOMINANT HABITAT TYPES (up to three within .5 km of nest) 1. CLIFF 2. UNVEGETATED GROUND 3. WET MEADOW 4. DWARF SHRUB MEADOW (tundra dominated by grasses or sedges) 5. GRASS MEADOW 6. DWARF SHRUB MAT (dwarf shrubs <0.4 M high) 7. LOW SHRUB THICKET (shrubs 0.5 - 1.1 M high) 8. MED. SHRUB THICKET (shrubs 1.2 - 2.4 M high) 9. TALL SHRUB THICKET (shrubs 2.5 - 5.0 M high) 10. DECIDUOUS FOREST 11. CONIFEROUS FOREST 12. MIXED DECIDUOUS-CONIFER FOREST 13. SCATTERED WOODLAND AND DWARF FOREST 14. ARTIFICIAL HABITAT 15. OTHER 16. MARINE (dist. km): E A 17. RIPARIAN (dist. km): E A 18. LACUSTRINE (LAKE) (dist. km): E A 19. RIVER / STREAM (dist. km): E A 20. OTHER PERRENIAL WATER (dist. km): E A FOR CLIFF NESTS – ABOVE CLIFF: (habitat types) BELOW CLIFF:	HEIGHT OF NEST ON CLIFF (M): E A ELEVATION OF NEST ABOVE SEA LEVEL (FT): ASPECT OF SLOPE: ASPECT OF NEST: NEST CONDITION: 1. GOOD 2. FAIR 3. POOR/REMNANT NEST ACCESSIBILITY (to ground predators): 1.EASY 2. MOD. DIFFICULT 3. VERY DIFFICULT DISTANCE TO HUMAN ACTIVITY (KM): E A HUMAN ACTIVITY VISIBLE FROM NEST? 1. YES 2. NO TYPE(S) OF HUMAN ACTIVITY: 1. TRAIL 7. CONSTRUCTION 2. ROAD 8. RESEARCH 3. BOATING 9. MINING 4. AIRCRAFT 10. OIL / GAS 5. BUILDING(S) 11. LOGGING 6. AGRICULTURE 12. OTHER:
CIRCLE ANY THAT APPLY: 1. PHOTO OF CLIFF TAKEN 4. PREY REMAINS COLL 8. OTHER WHITEWASH ON CLIFF 2. PHOTO OF EYRIE TAKEN 5. EGG(S) COLLECTED 9. OVERHANG AT EYRIE 3. EYRIE DESCRIP. ATTACHED 6. EGG SHELLS COLLECTED 10. AFTERNOON SHADING?: 7. WHITEWASH AT EYRIE a.YES b. NO c. UNKNOWN	

BANDING AND BAND RECOVERY INFORMATION

AGE	SEX	AVISE NO. - COLOR / LEG	BAND CODE - COLOR / LEG

Attachment C. Instructions for completing the Raptor Observation Record Card (1989)

Please complete the Observation and Nest Record Card to the fullest extent possible. Attach photographs and maps if available.

Observer:	Full name and address (and agency/institution/business if applicable).
Specific Area:	Give specific description of nest territory and nest site location, reference to a known, local landmark or physical feature.
Map Name/Num.:	Name and/or number of USGS map used for location data.
Nest Terr. Num:	A computer assigned number. Nest territories will be assigned numbers sequentially as they are entered in the database. If the survey is of a potential habitat rather than a known territory, this box should read, "Survey of Potential Habitat".
Site Number:	Use a letter for different nests or eyries within the territory. Assign letters sequentially as each nest or eyrie is used.
Year:	Year of survey, 4 digits.
Other Number:	Any other number or name an agency or individual has used in the past and may want to use for reference to old reports or data bases.
Latitude/UTM-N:	Decimal degrees or UTM zone-northerly (nest location).
Longitude/UTM-E:	Decimal degrees or UTM zone-easterly (nest location).
Species:	Common name or AOU 4 letter abbreviation.
Date:	Month-day-year.
Time:	Period spent observing, 24 clock (0700-0930).
Survey Method:	See code on card.
Adults, etc.:	Indicate number observed; A (actual) or E (estimated). Circle E unless absolutely positive of numbers.
Age of Nestlings:	To the nearest day. Circle actual or estimated.
Number Fledged:	Indicate number that reached 80% or more of fledging age.
Activity:	See code on card (may be more than one).
Season Summary:	Indicate number observed for each category.
Status:	The final status of the territory (see Status/Terminology Definitions).

<u>The following four fields pertain the one observation point that provides a clear view of the active nest</u>

UTM-N or Latitude of observation point:	Decimal degrees or UTM zone-northerly (observation point).
UTM-E or Longitude of observation point:	Decimal degrees or UTM zone-easterly (observation point).
Distance:	Distance from observation point to nest location in meters.
Bearing:	Bearing from observation point to nest location in degrees (true north).

Remarks:	Add any pertinent information not addressed above. May include a line drawing of area and nest site.

Note: If additional notes are needed, use and attach 5 x 7 sheets with the Card.

Attachment D. Instructions for completing the Raptor Nest/Eyrie Record Card (1989)

Tree Nests	
Species:	Use common name and circle any situation(s) that apply
Tree Height:	To nearest meter. Circle estimated or actual.
Tree Diameter:	To nearest cm at breast height. Circle estimated or actual.
Height of Nest in Tree:	To nearest meter. Circle estimated or actual.
Ground Nests	
Ground Nest Situation:	Self-explanatory.
Cliff Rock Type:	If known: 1. Sedimentary; 2. Igneous; 3. Metamorphic. Include specific formation if known.
Cliff Height:	To nearest meter, vertical distance from top of cliff to bottom of cliff. Circle estimated or actual.
Cliff Length:	To nearest tenth of kilometer. Circle estimated or actual.
Height of Nest on Cliff:	To nearest meter, distance from bottom of cliff to nest site. Circle estimated or actual.
Dominant Habitat Types:	Indicate at least 1 and up to 3 major habitat types within 0.5 km of nest site. Also indicate distance (km) to nearest perennial water.
Elevation Above Sea Level:	To nearest 20 feet.
Aspect of Slope/Nest:	True Direction in degrees, 0 to 360. 00=none (flat).
Nest Condition	
For cliff ledges:	Good: Large well-drained, flat, area, with good (stable) substrate for scrape or stick nest (size is relative to species, a large area would provide nearly fledged nestlings with room to move about and flap without being in danger of falling from ledge). Fair: Adequate size for species, mostly flat with area for scrape or nest. Poor/Remnant: Small, sloping, poorly drained, not useable.
For stick nests:	Good and Fair are both useable nest sites; Poor/Remnant is not useable.
Overhang:	The portion of the nest site used for nesting (scrape and surrounding area) is sheltered from most elements (rain, hail, snow), except for extreme conditions (very windy, etc.).
Accessibility:	To ground predators such as foxes or coyotes.
Distance to Human Activity:	To nearest tenth of kilometer.
Human Activity	
Visible from Nest:	Self-explanatory.
Types of Human Activity:	Closest and most prominent.
Circle Any That Apply:	Self-explanatory.
Banding Information:	Fill in as appropriate.

Attachment E. Definition of Terms for Raptor Observations

Alternate Nest
: An unoccupied nest site within the nesting territory of one pair of birds.

Breeding Territory
: The area within which courtship, copulation, nesting and food seeking usually occur.

Eyrie
: The actual ledge on a cliff containing eggs or young used by a pair of raptors during current nesting season.

Fledged Young
: Young that have flown for the first time. For survey purposes, young that have reached 80% or more of their respective fledging age are considered fledged young.

Nest Site
: The actual site of the nest or ledge. More than one nest site may be present within the territory of a pair of birds but used in different years.

Nest Territory
: An area that contains, or historically contained, one or more nests (or scrapes) within the breeding territory of a pair of mated birds, and where no more than one pair has ever bred in any year.

Nestling
: Young of the year between hatching and 80% of fledging age.

Occupied Nest Territory
: A nesting territory where one or two birds showing an affinity for the nesting territory during the breeding season were observed.

Productivity
: The number of nestlings raised to 80% of fledging age, expressed both as number per total pair and number per successful pair.

Successful Breeding
: Raising at least one nestling to 80% of fledging age or older.

Unoccupied Nest Territory
: A nesting territory where no bird showing an affinity for the territory during the breeding season was observed (investigators must spend a minimum of 4 hours at the territory to make this determination).

Attachment F. Breeding Status Terminology for Raptor Observations

1. Unoccupied:
   A nesting territory where no bird showing an affinity for the territory during the breeding season was observed (investigators must spend a minimum of 4 hours at the territory to make this determination).

2. Occupancy Unknown:
   A nesting territory where no bird showing an affinity for the territory during the breeding season was observed but investigators spent less than 4 hours at the territory.

3. Occupied--Non-breeding:
   A nesting territory where one or two birds showing an affinity for the nesting territory during the breeding season were observed but no eggs were laid (note: this category requires confirmation that no eggs were laid, therefore only those nests that were frequently observed can be assigned to this category).

4. Occupied--Breeding:
   An occupied nesting territory where eggs were laid (evidence includes young in nest, eggs or eggshells, or adults seen incubating) but where final breeding success was not determined.

5. Occupied--Unsuccessful Breeding:
   An occupied nesting territory where breeding was attempted but where no young reached 80% of its fledging age (for example, eggs destroyed or otherwise lost, eggs failed to hatch, or young hatched but died prior to fledging).

6. Occupied--Successful Breeding:
   An occupied nesting territory where one or more young reached 80% of its fledging age.

7. Occupied--Breeding Status Unknown:
   An occupied nesting territory where breeding or non-breeding could not be determined.

8. Occupied--Breeding Status Unknown, No Young Fledged:
   An occupied nesting territory where breeding or non-breeding could not be determined but it was certain that no young fledged.

Attachment G. USFWS Peregrine Falcon Monitoring Form

----Return this form to your State or Regional Coordinator ----

Observation Date: (M/D/YR)_____ Nest Site Name or #_____

Which Territory Visit is this? (circle one) 1st 2nd 3rd 4th

Nest Site (circle one): Manmade Natural

Observation Time: Begin_____ End_____
(Should be at least 4 hrs if occupancy, nest age, or nestling number are in question)

Observer(s)_____

Phone:_____
Email:_____Agency/NGO_____

WEATHER: Precipitation_____ Wind (speed estimate)_____

Temperature_____ Cloud cover (%)_____

Note conditions at beginning (beg.) and ending (end) of observation period if different

Observation post: (distance in meters)_____

Approx. Nesting Phase: (determined how?)_____
_____
_____
_____

Peregrines present: (define as ad. male, ad. female, ad. unknown, subad. Male, subad. Female, or subad. Unknown, and number of each.)_____
_____

Behaviors observed:_____
_____
_____
_____

_____
_____

Nest observed? Y N Feeding at nest observed? Y N Eggs observed? Y N Unk

How many eggs?_____Young observed (AGE)?_____

How many young?_____ Other Observations:_____
_____
_____
_____
_____
_____
_____

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 6

Contaminant Monitoring

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) describes the procedures for the collection of samples for measuring contaminants in Peregrine Falcons. The contaminant protocols are specified in Appendix G of the USFWS Monitoring Plan for the American Peregrine Falcon (USFWS 2003). Although the USFWS Plan outlines the protocol for contaminant monitoring, training of investigators is not addressed. Training for contaminant monitoring involves obtaining permits and competency in the more complicated procedure of entering nests to band nestlings, collecting addled eggs and collecting feather samples. At this time, Northern Colorado Plateau Network (NCPN) park units are not required to do contaminant monitoring, and future needs for this kind of data typically will be met by teams from outside agencies. Therefore, training for contaminant monitoring is not addressed in this SOP.

References:

U.S. Fish and Wildlife Service. 2003. Monitoring Plan for the American Peregrine Falcon, A Species Recovered Under the Endangered Species Act. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, OR. 53 pp.

USFWS Monitoring Plan for the American Peregrine Falcon
Appendix G: Collecting. Preparing, and Shipping Egg and Feather Samples

All sample collectors should coordinate with Regional and National Coordinators prior to collection and if additional information is required.

A. Protocol for Collection and Removal of Peregrine Egg Contents

Objectives

1. Ensure accurate analysis of contaminants in eggs by providing standard methods to transfer egg contents from the shell into a clean container without introducing contamination.
2. Provide a standard method to measure eggshell thickness.

Materials

For field collection: Appropriate State and Federal permits; writing utensils; labels; egg collection boxes (hard-sided container such as plastic kitchen ware or tackle box with foam padding); sheets of chemically-clean[2] aluminum foil, cut to size (approximately 10 x 15 cm), one per egg; small plastic bags with zip closure.

For contents removal in laboratory: Data sheets; writing utensils; safety glasses; powder-free latex gloves; laboratory paper wipes such as Kimwipes®; distilled, deionized (DD) water or equivalently pure water, clean sponge; balance (to 0.01 g); vernier calipers (to 0.01 mm); immersion chamber with beaker and wire loops (Figure G-l); Teflon® bags, one per egg; chemically-clean stainless steel serrated blades (such as high-quality steak knives); chemically-clean stainless steel scalpel blades (No. 21 or No. 22 with No. 4 handles or similar size); chemically-clean aluminum foil sheets (approximately 30 x 30 cm square), 1 per egg; ball-tip micrometer (to 0.01 mm).

Procedures

In the field, collect all whole, uncracked, addled eggs from nest. Wrap each in clean aluminum foil (dull side next to the egg). The foil should act as a second skin, which keeps the eggshell together and the contents inside should the egg be cracked in transit. Place the wrapped egg inside bag with zip closure, then into hard container for transport to refrigeration (within 24 hours). Use padding to immobilize the egg. Place a label inside the zip-closure bag with date, collector, nest identification and location (UTM coordinates), and the egg number if multiple eggs are collected. Refrigerate eggs until opened (ideally within 48 hours).

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[2] > Chemically-clean aluminum foil has been rinsed with reagent-grade acetone and hexanes on the dull side and allowed to air-dry; dull side is then considered the ~clean™side. Chemically-clean stainless instruments are rinsed with 10-20% nitric acid, then doubly-distilled or equivalently purified water, air-dried, then rinsed with reagent-grade acetone and hexanes and air-dried.

In the laboratory, use one data form (Figure G-2) per egg. Wear powder-free latex gloves and safety glasses (severe eye infection can result from contact with rotting egg contents). Carefully check for cracks in shell; if present, do not wet or immerse the egg. If debris is present, rinse egg in DD water while gently scrubbing with sponge. Dry the egg. Record the mass (g) of the whole egg, then measure the length and breadth of the egg at their greatest dimensions with calipers (caliper jaws parallel to the longitudinal axis of the egg for length, perpendicular to the longitudinal axis of the egg for breadth). Compute average of three measurements for final width and length measurements.

Measure total egg volume by water displacement. Fill the immersion chamber (Figure G-la) with distilled water past the point where water comes out of the spigot. Let drain until water stops coming out of the spigot. Place a clean beaker on a balance, zero the balance, and place the balance and beaker under the spigot (Figure G-lb). Immerse egg with wire loops (Figure G-lc) until top of egg is just under the water surface. Hold the egg steady until water stops draining out of spigot into the beaker. The readout on the balance will reflect only the weight of water that has gone into the beaker, if you zeroed the balance after the beaker was placed on it. The weight of water is the approximate egg volume, assuming that egg density is similar to water (1 gm = 1 ml). For example, 40 gm displaced water = 40 ml of water, and 40 ml egg volume. Dry the egg.

While transferring egg contents to Teflon® bag, avoid letting contents run over your hands into the bag. Note that addled eggs can be full of decomposition products, producing gaseous explosions at any weak point in the shell, including the score or where membranes are first exposed. Working with a refrigerated, cool egg reduces this potential, but be prepared for egg explosions, and wear safety glasses.

Create a catch basin out of the aluminum foil (chemically-clean side up) by turning edges up and securing the comers. This will catch egg contents in case they spill over the edge of the bag. Use a separate piece of foil for each sample. The foil also is a clean place to place your instruments when they are not in use. Tare balance with Teflon® bag, then place bag in center of aluminum foil.

Score egg at the equator with a clean serrated blade or scalpel. Cradle the egg in one hand without squeezing too tightly, and gently score while rotating the egg. Many light strokes are preferable to a fewer deeper strokes, increasing the evenness of the score and decreasing the possibility of fractured eggshells. Continue to score until you see the membrane, which usually appears gray underneath the white of the eggshell. Try to expose the membrane evenly around the entire egg.

Place the egg over the open bag and cut through membranes with the scalpel. Pour contents into bag, and use the scalpel to gently scrape if necessary. Close the bag. Note where the membranes are, as this is important for thickness measurements. For fresh eggs, both membranes often stay with the shell, but as the embryo develops the inner membrane tends to stick with the embryo. If you cannot determine where the membranes are, it often becomes clearer after the eggshell and membranes have dried. Record mass of full bag, then subtract tare mass to compute egg contents mass. Label the bag with nest

and egg identification information. Freeze the sample (-40, C is preferable but 0, C is adequate) until shipment to central repository.

If egg is developed, estimate age of embryo. Peregrine incubation is 29-33 days (Ehrlich et al. 1988); estimate age of embryo to first, second, third, or fourth quarter. Photographic records of avian embryo development provide reference points to make this determination (e.g., Powell et al. 1998, Bird et al. 1984). Note amount of decay (no decay, slightly decayed, or rotten) and examine for deformities, particularly bill deformities such as crossed bills or lack of jaws, but also lack of skull bones, club feet, rotated ankles, or dwarfed appendages (Gilbertson et al. 1991).

Rinse the eggshell halves with cool water and allow to air dry. Using an ultra-fine tip marker or pencil, identify each shell half (with nest and egg information). Dry eggshells at room temperature for 10-30 days, or until they have attained a constant mass. Then, measure thickness at three points near the equator on each shell half using ball-tip micrometer. Note whether you measured the membranes, as museum specimen thickness measurements often include the membranes. Finally, record the mass of the dried eggshell (to 0.001 g). This information is also used to compare to museum specimens.

Compute conversion factor, as explained on the data sheet. Historically, contaminant concentrations were multiplied by this conversion factor to get volume-adjusted residue data (Stickel et al. 1973).

Shipping

Place frozen, bagged contents in a cooler with dry ice (know the labeling requirements of your shipping company for dry ice) for shipping. If you are unable to find dry ice, contact Paul Decker (information below) for shipping instructions. Send via overnight service to the central storage repository:

National Institute of Standards and Technology
Hollings Marine Laboratory
331 Ft. Johnson Rd.
Charleston, SC 29412
Attn: Peregrine Project
Paul Becker or Rebecca Pugh
(843) 762-8861
paul.becker@noaa.gov

Notify the recipient by telephone prior to shipping, and try to ship on Monday, Tuesday, or Wednesday to avoid weekend delays.

B. Protocol for Collection of Peregrine Feathers

Objective

1. Ensure accurate and precise analysis of metallic contaminants in feathers by providing methods to collect similar feathers from same-age Peregrines.

Materials
Appropriate State and Federal permits; writing utensils; labels; Teflon® collection bags; clean stainless steel scissors.

To collect feathers, the largest nestling (which is often the nestling with the most advanced feather development) will be the only nestling sampled per nest. Remove up to the distal 1.5 cm of the 4th secondary wing feather, from one side only, using clean stainless steel scissors. Do not cut the follicle, which is vascularized and therefore prone to bleeding during feather development. Store the sample in a Teflon®) (Saivellex, Inc. or equivalent) collection envelope provided by the National Coordinator. Fill out the feather collection data form (Figure G-3). Feathers samples can be frozen or stored at room temperature.

Shipping
Send feather samples to the central storage repository via overnight or otherwise guaranteed service. Notify the recipient by telephone prior to shipping:

National Institute of Standards and Technology
Hollings Marine Laboratory
331 Ft. Johnson Rd.
Charleston, SC 29412
Attn: Peregrine Project
Paul Becker or Rebecca Pugh
(843) 762-8861
paul.becker@noaa.gov

Literature Cited - Appendix G

Bird, D.M, J. Gautier, and V. Montpetit. 1984. Embryonic growth of American kestrels. Auk 101:392-396.

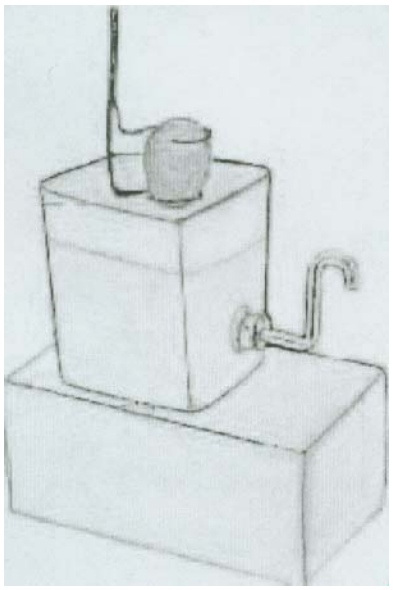
Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The Birders Handbook. Simon and Schuster, Inc., New York, NY, USA. 785 pp.

Gilbertson, M., T. Kubiak, J. Ludwig, and G. Fox. 1991. Great Lakes embryo mortality, edema, and deformities syndrome (GLEMEDS) in colonial fish-eating birds: similarity to chick-edema disease. J. Toxicol. Environ. Health 33:455-520.

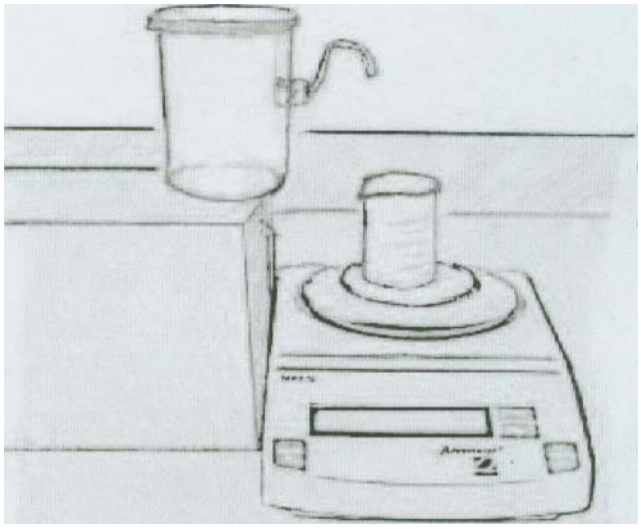
Powell, D.C., R.J. Aulerich, R.J. Balander, K.L. Stromborg, and S.J. Bursian. 1998. A photographic guide to the development of double-crested cormorant embryos. Colonial Waterbirds 21 (3):348-355.

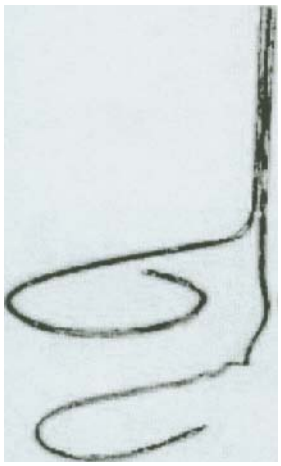
Stickel, L.F., S.N. Wiemeyer, and L.J. Blus. 1973. Pesticide residues in eggs of wild birds: adjustment for loss of moisture and lipid. Bull. Environ. Contam. Toxicol. 9:193-196.

a.



b.





c.

Figure G-1. Measuring Total Egg Volume. a. Egg immersion chamber. The top bend of the spigot is high enough so that an egg can be completely immersed below it. b. Immersion chamber set up to drain into beaker on balance, c. Wire loops used to hold the egg.

Figure G-2. Peregrine Falcon Egg Contaminants Data Sheet

Monitoring Region:_____
Collector name and affiliation:_____
Processor name and affiliation:_____
Date Collected: _____ Date Processed: _____
Nest Number or location:_____
Egg Number or description:_____
Nest status at time of collection:_____
(laying, incubating, abandoned, with chicks - how many, post-fledging, etc.)

Egg Length (three measurements, 0.1 mm): _____, _____, _____ _____Average
Egg Width (three measurements, mm): _____, _____, _____ _____Average
Whole Egg Weight (0.01 g): _____
Weight of displaced H_2O (egg volume) (0.01 g): _____

Contents weight:
a) Tare weight of bag (0.01 g): _____
b) Weight of bag plus contents (0.01 g): _____
c) Weight of contents (b-a): _____

Conversion factor = $\frac{\text{contents weight}}{\text{displaced } H_2O \text{ weight}}$ = _____

Contents condition (age of embryo, state of decay, etc.) and other comments:
_____
_____
_____

Where are the membranes? Inner: _____ Outer: _____

Eggshell thickness (0.01 mm) after > 10 days of air drying (note whether either, neither, or both membranes are included in the measurements):

First eggshell half: ____, ____, ____, ____ Avg: ____
Second eggshell half: ____, ____, ____, ____ Avg: ____ Overall Average: _____

Dry shell weight (mg) after > 10 days of air drying: _____

Additional comments:
_____
_____
_____
_____
_____

Figure G-3. Peregrine Falcon Feather Contaminants Data Sheet

Monitoring Region: _____

Collector name and affiliation: _____

Date Collected: _____

Nest Number or location:_____

USFWS band number: _____

Additional band description and numbers: _____

Estimated age of nestling: _____

Estimated sex of nestling: _____

Was feather sample collected from (circle) left or right side of nestling?

Additional comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 7

Data Management

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) describes data management procedures for all data derived from monitoring Peregrine Falcons in Northern Colorado Plateau Network (NCPN) park units. This SOP applies to data from all territories monitored, regardless of whether the territory was selected for sampling in the USFWS Plan. The USFWS Plan states that all Peregrine Falcon monitoring data will be useful in their analysis of population trends; therefore, data from all territories will be made available to the agency contacts listed below.

For Zion N.P., Bryce Canyon N.P., Capitol Reef N.P.:
Southern Region Wildlife Manager, UDWR
Keith Day
1470 North Airport Road
Cedar City, UT 84720
435-865-6120

For Canyonlands N.P., Natural Bridges N.M., Arches N.P.:
Southeastern Region Wildlife Manager, UDWR
Bill Bates
475 West Price River Dr, Ste C
Price, UT 84501
435-636-0262

For Black Canyon of the Gunnison N.P., Colorado N.M., Curecanti N.R.A., Dinosaur N.M.:
State Cooperator – Colorado
Brent Bibles, Ph.D.

Colorado Division of Wildlife
317 W. Prospect Road
Fort Collins, Colorado 80526
970-472-4307 office
970-420-6215 cell
brent.bibles@state.co.us

This SOP also describes and documents the database *Peregrine_Monitoring_1-0.mdb* and provides instructions for the development, maintenance and distribution of monitoring data associated with the NCPN American Peregrine Falcon Monitoring Protocol. Procedures for data handling and quality assurance/quality control for all monitoring protocols implemented by the Northern Colorado Plateau Network are detailed in the network's Data Management Plan posted at http://science.nature.nps.gov/im/units/ncpn/bib_library/beer_2004_573089.pdf.

I. Data Model

Microsoft Access XP is the primary software environment for managing tabular data. ESRI ArcGIS serves as a tool for the validation of spatial data residing in Access. All data files must reside on a secure server or hard drive with regular backup routines and off-site storage rotation.

The database consists of two files in a front-end, back-end configuration that can be linked using a utility included with the database. The file *Peregrine_Monitoring_1-0.mdb* contains the forms, queries, and VBA code for the application itself; *Peregrine_Monitoring_be_1-0.mdb* contains the data tables. The front-end, back-end configuration allows continual improvements to the database user interface without altering the data structure or records. The database file name will change according to the database version number, which will be identical to the Data Management SOP version.

Figure 7-1 shows the relationships among the primary tables in the database. Data related to the area surveyed, which can be an existing territory or potential habitat, are entered into tbl_survey_location. Multiple survey events can be associated with one survey location. If birds are observed during the survey, details are recorded on their activity in tbl_survey_event. Data are also recorded if no birds are observed so that negative survey results are tracked. If a nest is observed, details are collected on the nest location, age and number of birds, and nest habitat in tbl_nest_location, tbl_nest_details, and tbl_nest_habitat. Each survey event is linked to tbl_master_version_table that defines the narrative and suite of SOP versions in effect at the time of the survey.

Location data as x,y coordinates are collected only if a nest site is observed, and two methods are used. The first method is to determine UTM coordinates (via GPS) of a reference position in the field from which bearing and distance to the nest site are recorded. This information helps subsequent observers relocate a position from which

the nest can be observed. Upon returning from the field, a second set of UTM coordinates that corresponds to the nest site location is derived by digitizing the nest location from a 1:24K-scale (or larger-scale) topographic map.

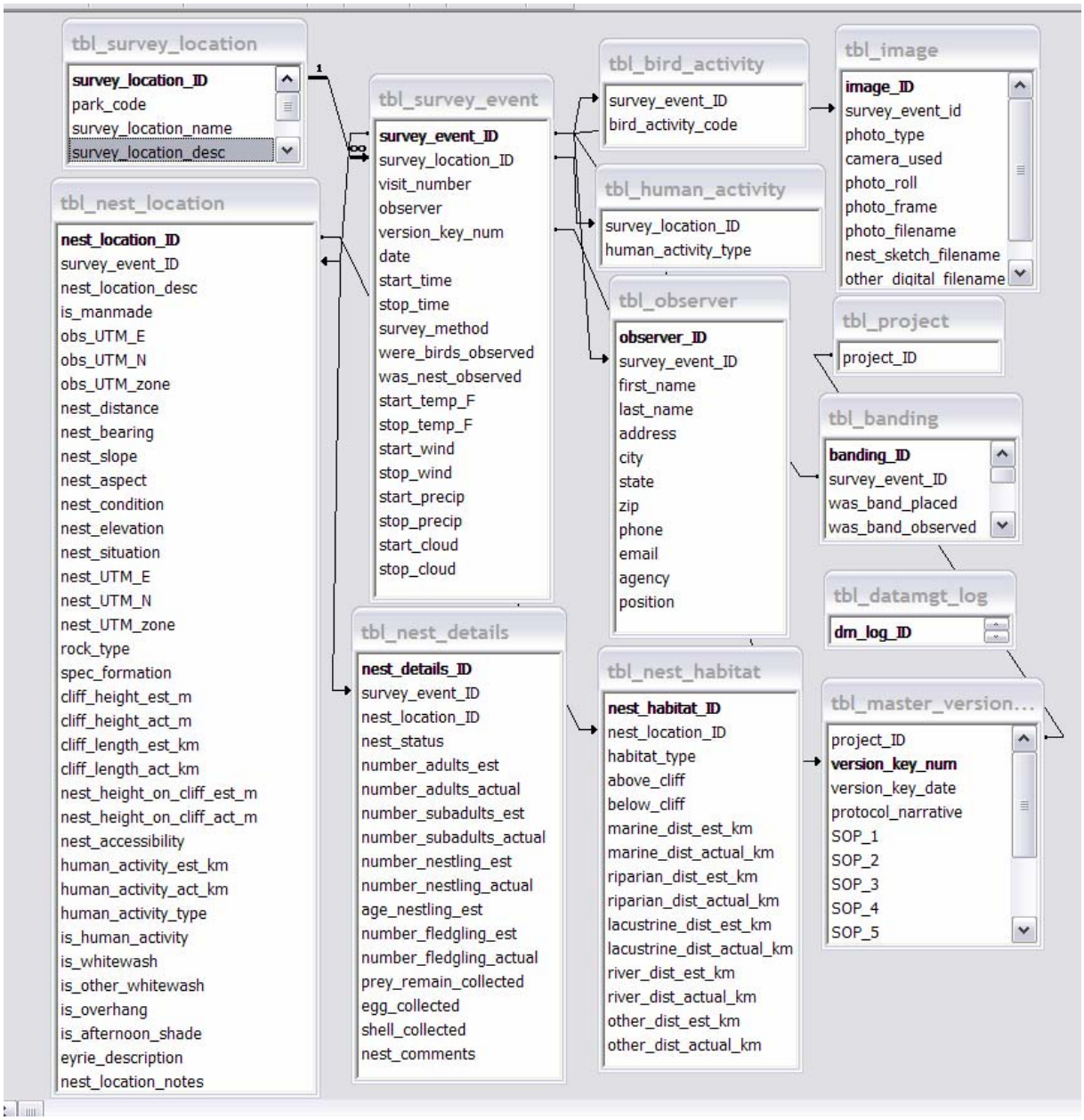


Figure 7-1. Data model for Peregrine Falcon monitoring. All look-up tables are not shown.

II. Documentation of Database Tables

Table: **tbl_banding**
Description: Information regarding banding or banded peregrines.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
banding_ID	Unique record identifier	dbLong	4
survey_event_ID	foreign key; link to tbl_survey_event	dbLong	4
was_band_placed	Was a peregrine banded?	dbBoolean	1
was_band_observed	Was a previously-banded peregrine observed?	dbBoolean	1
bird_age	Age class of banded bird. BBL abbreviations: U=unknown, L=local, HY=hatching year, AHY=after hatching year, SY=second year, ASY=after second year, TY=third year, and ATY=after third year	dbText	3
bird_sex	Sex of banded bird. BBL abbreviations: U=unknown, F=female, M=male	dbText	1
status	BBL code for status (see http://www.pwrc.usgs.gov/bbl/manual/status.htm)	dbText	50
band_number	Bird band number (including prefix)	dbText	50
band_color	Color of band	dbText	50
band_leg	Which leg is banded, right or left?	dbText	50
band_notes	Comments regarding banded bird observation	dbText	50

Table: **tbl_bird_activity**
Description: Peregrine activity/behavior descriptions.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
survey_event_ID	Unique record identifier	dbLong	4
bird_activity_code	Activity or behavior of bird (from tlu_bird_activity)	dbText	50

Table: **tbl_datamgt_log**
Description: Table containing a log of data set manipulations or database object alterations.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
dm_log_ID	Unique record identifier	dbLong	4
item_description	What was done with the data set? Include changes to data and changes to database objects or structures.	dbMemo	0

Table: **tbl_human_activity**
Description: Human activity detected in survey area.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
survey_location_ID	foreign key; link to tbl_survey_location	dbLong	4
human_activity_type	type of human activity at survey location (use tlu_human_activity)	dbText	50

Table: **tbl_image**
Description: Photo and other digital image related information.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
image_ID	Unique image record identifier	dbLong	4
survey_event_id	foreign key; link to tbl_survey_event	dbLong	4
photo_type	Type of image - e.g., slide, photograph, digital image	dbText	15
camera_used	Type of camera used (e.g., Nikon Coolpix 4500)	dbText	50
photo_roll	Photo roll ID	dbText	50
photo_frame	Photo frame ID	dbText	50
photo_filename	Unique image filename	dbText	50
nest_sketch_filename	Unique nest sketch digital filename	dbText	50
other_digital_filename	Unique filename for other digital image file	dbText	50

Table: **tbl_master_version_table**
Description: Reference of all protocol versions that are in effect at a given time.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
project_ID	Unique identifier for project	dbLong	4
version_key_num	Protocol version key number (maintained in SOP #10)	dbLong	4
version_key_date	Date of protocol version key number	dbDate	8
protocol_narrative	Version of protocol narrative	dbText	50
SOP_1	Version of SOP #1	dbDecimal	16
SOP_2	Version of SOP #2	dbDecimal	16
SOP_3	Version of SOP #3	dbDecimal	16
SOP_4	Version of SOP #4	dbDecimal	16
SOP_5	Version of SOP #5	dbDecimal	16
SOP_6	Version of SOP #6	dbDecimal	16
SOP_7	Version of SOP #7	dbDecimal	16
SOP_8	Version of SOP #8	dbDecimal	16
SOP_9	Version of SOP #9	dbDecimal	16
SOP_10	Version of SOP #10	dbDecimal	16

Table: **tbl_nest_details**
Description: Description of peregrines at the nest and related nest activities.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
nest_details_ID	Unique record identifier	dbLong	4
survey_event_ID	foreign key; link to tbl_survey_event	dbLong	4
nest_location_ID	foreign key; link to tbl_nest_location	dbLong	4
nest_status	Status of nest (from tlu_nest_status_)	dbText	50
number_adults_est	Estimated number of adults at nest site	dbLong	4
number_adults_actual	Actual number of adults at nest site	dbLong	4
number_subadults_est	Estimated number of subadults at nest site	dbLong	4
number_subadults_actual	Actual number of subadults at nest site	dbLong	4
number_nestling_est	Estimated number of nestlings in nest	dbLong	4
number_nestling_actual	Actual number of nestlings in nest	dbLong	4
age_nestling_est	Estimated age of nestlings in nest (in days)	dbLong	4
number_fledgling_est	Estimated number of fledglings (reached 80% of fledgling age) at nest site	dbLong	4
number_fledgling_actual	Actual number of fledglings (reached 80% of fledgling age) at nest site	dbLong	4
prey_remain_collected	Did observers collect prey remains from nest site?	dbBoolean	1
egg_collected	Number of eggs observers collected from nest	dbInteger	2
shell_collected	Did observer collect egg shells from the nest site?	dbBoolean	1
nest_comments	Comments regarding nest details	dbText	50

Table: **tbl_nest_habitat**

Description: Description of nest habitat types and distance from various water source types.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
nest_habitat_ID	Unique record identifier	dbLong	4
nest_location_ID	foreign key; link to tbl_nest_location	dbLong	4
habitat_type	Habitat type (from tlu_habitat_type)	dbText	50
above_cliff	Habitat type above nesting cliff area (choose from Dominant Habitat Types on Raptor Nest/Eyrie Record Card)	dbText	50
below_cliff	Habitat type below nesting cliff area (choose from Dominant Habitat Types on Raptor Nest/Eyrie Record Card)	dbText	50
marine_dist_est_km	Estimated distance, in kilometers, from nest to marine habitat	dbLong	4
marine_dist_actual_km	Actual distance, in kilometers, from nest to riparian habitat	dbLong	4
riparian_dist_est_km	Estimated distance, in kilometers, from nest to riparian habitat	dbLong	4
riparian_dist_actual_km	Actual distance, in kilometers, from nest to riparian habitat	dbLong	4
lacustrine_dist_est_km	Estimated distance, in kilometers, from nest to lake	dbLong	4
lacustrine_dist_actual_km	Actual distance, in kilometers, from nest to lake	dbLong	4
river_dist_est_km	Estimated distance, in kilometers, from nest to river/stream	dbLong	4
river_dist_actual_km	Actual distance, in kilometers, from nest to river/stream	dbLong	4
other_dist_est_km	Estimated distance, in kilometers, from nest to other perrenial water	dbLong	4
other_dist_actual_km	Actual distance, in kilometers, from nest to other perrenial water	dbLong	4

Table: **tbl_nest_location**
Description: Established peregrine nest description and location information.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
nest_location_ID	unique record identifier	dbLong	4
survey_event_ID	foreign key; link to tbl_survey_event	dbLong	4
nest_location_desc	Description of nest location	dbText	50
is_manmade	Is the nest manmade?	dbBoolean	1
obs_UTM_E	UTM coordinate at observation point (Easterly)	dbLong	4
obs_UTM_N	UTM coordinate at observation point (Northerly)	dbLong	4
obs_UTM_zone	UTM zone at observation point	dbLong	4
nest_distance	Distance from observation point to nest (meters)	dbLong	4
nest_bearing	Bearing from observation point to nest (degrees); set declination for true north	dbInteger	2
nest_slope	Slope aspect of nest cliff (degrees)	dbInteger	2
nest_aspect	Slope aspect of nest (degrees)	dbInteger	2
nest_condition	Condition of nest (good, fair, poor/remnant)	dbText	4
nest_elevation	Nest elevation above sea level (feet)	dbLong	4
nest_situation	Nest situation (cliff ledge, cliff sticknest, cliff cavity, open hillside, level ground, other)	dbText	15
nest_UTM_E	UTM coordinate of nest (Easterly) – digitized from map	dbLong	4
nest_UTM_N	UTM coordinate of nest (Northerly) – digitized from map	dbLong	4
nest_UTM_zone	UTM zone of nest location	dbInteger	2
rock_type	Cliff rock type (Sedimentary, Igneous, Metamorphic)	dbText	15
spec_formation	Rock formation, if known (e.g., Morrison, Entrada)	dbText	15
cliff_height_est_m	Estimated distance from bottom to top of cliff (meters)	dbLong	4
cliff_height_act_m	Actual distance from bottom to top of cliff (meters)	dbLong	4
cliff_length_est_km	Estimated length of cliff (kilometers - to nearest tenth)	dbLong	4
cliff_length_act_km	Actual length of cliff (kilometers - to nearest tenth)	dbLong	4
nest_height_on_cliff_est_m	Estimated height from bottom of cliff to nest (meters)	dbLong	4
nest_height_on_cliff_act_m	Actual height from bottom of cliff to nest (meters)	dbLong	4
nest_accessibility	Nest accessibility to ground predators (Easy, Moderately Difficult, Very Difficult)	dbText	20

tbl_nest_location. cont.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
human_activity_est_km	Estimated nearest human activity to nest (kilometers - to nearest tenth)	dbLong	4
human_activity_act_km	Actual nearest human activity to nest (kilometers - to nearest tenth)	dbLong	4
human_activity_type	Closest and most prominent type(s) of human activity (trail, road, boating, aircraft, building, agriculture, construction, research, mining, oil/gas, logging, etc.)	dbText	50
is_human_activity	Is there human activity visible from the nest?	dbBoolean	1
is_whitewash	Is there whitewash at the nest?	dbBoolean	1
is_other_whitewash	Is there other whitewash on the cliff area?	dbBoolean	1
is_overhang	Is there an overhang (sheltered from most elements except for extreme conditions) over the eyrie?	dbBoolean	1
is_afternoon_shade	Is the nest shaded in the afternoon?	dbBoolean	1
eyrie_description	Describe the eyrie	dbText	50
nest_location_notes	Additional notes on nest location	dbText	50

Table: **tbl_obs_location**

Description: Location information for potential habitat surveyed.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
obs_location_ID	Unique record identifier	dbLong	4
park_code	Standard 4-letter Park code	dbText	4
UTM_E	UTM coordinate of observation point (Easterly)	dbLong	4
UTM_N	UTM coordinate of observation point (Northerly)	dbLong	4
UTM_zone	UTM zone of observation point	dbLong	4
datum	Datum of coordinates	dbText	50
USGS_quad	Full official name(s) printed on each 7-1/2 minute USGS quadrangle that covers the site location. If more than one quad, separate the quad names with a comma and a space.	dbText	50

Table: **tbl_observer**
Description: Name and contact information for observers.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
observer_ID	unique record identifier	dbLong	4
survey_event_ID	foreign key; link to tbl_survey_event	dbLong	4
first_name	First name of observer	dbText	50
last_name	Last name of observer	dbText	50
address	Street address of observer	dbText	50
city	City location of observer	dbText	50
state	2-Letter state abbreviation of observer	dbText	2
zip	Zip Code location of observer	dbLong	4
phone	Phone number of observer (including area code)	dbText	50
email	email address of observer	dbText	50
agency	Agency to which observer is affiliated	dbText	50
position	Position title of observer	dbText	50

Table: **tbl_project**
Description: Contains identifier for project; enables link to master_version_table.mdb.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
project_ID	Unique identifier for project	dbLong	4

Table: **tbl_survey_event**
Description: Event-specific information for survey.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
survey_event_ID	Unique record identifier	dbLong	4
survey_location_ID	foreign key; link to tbl_survey_location	dbLong	4
visit_number	Visit number for the current sample year	dbInteger	2
observer	Name of observer	dbText	50
version_key_num	Version key number in effect on survey date (see tbl_master_version_table)	dbInteger	2
date	Date of survey	dbDate	8
start_time	Observation start time	dbDate	8
stop_time	Observation stop time	dbDate	8
survey_method	Survey was done by: foot, vehicle, boat, plane, helicopter, incidental obs	dbText	15
were_birds_observed	Were any peregrines observed?	dbBoolean	1
was_nest_observed	Was the peregrine eyrie observed?	dbBoolean	1
start_temp_F	Temperature (Fahrenheit) at start of observation	dbLong	4
stop_temp_F	Temperature (Fahrenheit) at end of observation	dbLong	4
start_wind	Wind speed (kilometers/hour) at start of observation	dbLong	4
stop_wind	Wind speed (kilometers/hour) at end of observation	dbLong	4
start_precip	Describe precipitation, if any, at start of observation; be specific - mist, light rain, moderate rain, heavy rain, light snow, etc.	dbText	20
stop_precip	Describe precipitation, if any, at end of observation; be specific - mist, light rain, moderate rain, heavy rain, light snow, etc.	dbText	20
start_cloud	Percent cloud cover at start of observation (use 10% increments)	dbLong	4
stop_cloud	Percent cloud cover at end of observation (use 10% increments)	dbLong	4

Table: **tbl_survey_location**
Description: Location and description of established territories or potential habitat.

FIELD NAME	FIELD DESCRIPTION	FIELD TYPE	FIELD WIDTH
survey_location_ID	Unique record identifier	dbLong	4
park_code	Standard 4-letter Park code	dbText	4
survey_location_name	Name of survey location	dbText	50
survey_location_desc	Description of survey location	dbText	50
is_known_territory	Is this an established territory? "No" indicates that this is potential habitat surveyed.	dbBoolean	1
territory_number	Unique number assigned to each individual established territory.	dbLong	4

III. Data Entry

Data entry should occur as soon as possible after data collection is completed, before the next observation occurs, and by the person who collected the data or someone who is familiar with the project and data. The primary goal of data entry is *to transcribe the data from paper records into the computer with 100% accuracy.*

A database users' manual is provided with the database; however, the project leader makes certain that persons performing data entry understand how to enter data and follow the protocols. Data entry technicians are responsible for becoming familiar with the field data forms, the database software, database structure, and any standard codes for data entry.

Before beginning a data entry session the user must create a backup of the back-end data files. This backup will ensure that the initial data starting point can be recovered should irreversible errors or problems occur during the data entry session. A prompt will appear at the onset of a data entry session that will ask the person doing data entry if a backup has been made. See the section on version control (below) for naming conventions for backup files.

The person doing data entry will enter his or her initials at the onset of a data entry session which, along with the date, will be stored along with the data record. QA/QC measures for data entry will be built into the database forms to automatically validate data where possible. Data entry forms will maximize the use of auto-filled fields, range limits, pick lists, and spelling checks. Data entry forms also provide controlled access to the database (i.e., forms are set for data entry only), which prevents accidental deletion or alteration of existing data and controls the sequence of data entry (i.e., certain fields require an entry before more information can be entered). Error messages will alert the operator to correct mistakes.

IV. Data Verification and Validation

<u>Data Verification</u>
Data verification immediately follows data entry and involves checking the accuracy of the computerized records against the hard copy field records and identifying and correcting any errors. All records entered will be verified against their original source in the following order:

1. Visual review at data entry. The person doing data entry verifies each record after input and immediately corrects any errors.

2. Visual review after data entry. All records entered during a data entry session are printed in a format that closely matches the original data sources. Each data element on the printout is compared with the original values from the hard copy,

preferably by second person who did not perform the data entry. Errors are clearly marked and corrected in the database as soon after data entry as possible.

3. Summary queries and tallies. Queries are run that detect broad errors such as duplicate or omitted records.

4. Visual review of spatial data. Nest observation and location data are converted to GIS and visually inspected for accuracy. This review can take place at the end of a field season.

Data Validation

While many errors are prevented by including validation routines that function during data entry, additional review of the data by a project specialist is needed to detect generic and specific errors that fall outside the scope of automated validation.

Invalid data commonly consist of slightly misspelled names, the wrong date, or out-of-range errors in parameters with well-defined limits (e.g., elevation). Other errors consist of unreasonable metrics or associations. Validation queries will be of two types: one type will present tabular data in ways that records can be reviewed for content and context; the other type will perform specific calculations or routines to detect logic or range errors.

Corrections to errors detected during validation require notations in the *original paper field records* about how and why the data were changed. Modifications to the field records should be clear and concise while preserving the original data entries or notes. Validation efforts should also include a check for the completeness of a data set since field sheets or other sources of data could easily be overlooked.

A summary of verification and validation that has been completed, along with any comments or notes, is entered into tbl_datamgt_log once the process is complete.

Data Quality Review and Communication

The project leader and any personnel involved in data collection or entry will meet several times during the field season to discuss data quality problems and issues. Procedures may need revision if verification and validation processes reveal an unacceptable level of data quality. Quality checks may also reveal the need to modify field or computer forms if data transcription or entry errors are frequent.

The project leader will use data documentation and metadata to notify end users and other project personnel of project data quality.

V. Version Control

Version control is the process of managing copies of changing files over the course of a project. Change includes any alteration to the structure or content of the files, which

should not be made without the ability to fully recover a data set as it existed before changes were made. Before making any major changes to a file, a copy of the file should be saved with a unique version number. NCPN recommends the following directory structure for database files:

peregrine_falcon\data\current_data
\working_backup
\annual_archive
\version_archive

Peregrine Falcon data files will be named per the following examples:

Current Database file*:*
peregrine_monitoring_1-00.mdb; peregrine_monitoring_be_1-00.mdb
The current database version number (visible from the database log-in screen) is incorporated into the file name before the mdb file extension. Files with this naming structure are assumed to be the most current, master versions of the database. These files are saved in the 'current_data' directory. Note: use underscores or dashes in database names, not periods or other punctuation.

Working Backup files:
PerMon1-00_12Oct04.mdb
These backups are made of the back-end files before beginning a data entry session (it is not necessary to back up the front-end). An abbreviation of peregrine monitoring, the database version number, and the date the copy was made are incorporated into the filenames of backups. At the end of a project season, the project manager will review these backups and determine which can be deleted. These files are saved in the 'working_backup' directory.

Annual Archive files:
PerMon1-00_Year04.mdb; *PerMon1-01_be_Year04.mdb*
When final data entry, verification, and validation have been completed for a field season, a set of annual archive files (front and back ends) is created. An abbreviation of peregrine monitoring, the database version number, and the year the copy was made are incorporated into the filename of annual archives. These files are saved in the 'annual_archive' directory.

Version Archive files:
PerMon1-00_Archive.mdb; PerMon1-00_be_Archive.mdb
Long-term archive files (front and back ends) are created before any database version upgrade occurs. An abbreviation of peregrine monitoring, the database version number, and the term Archive are incorporated into the filename of archives. These files are saved in the 'version_archive' directory, with a subdirectory created for each version. Example:
\version_1-00\PerMon1-00_be_Archive.mdb
\version_1-20\PerMon1-20_be_Archive.mdb

VI. Data Archiving

An overview of the processing and disposition of project data is provided in Table 7-1.

Digital Data
Any time a revision of protocols requires a revision to the database, a complete copy of the database will be made and stored in an archive directory (see Version Control, above). In addition to this copy in its native database format, all tables will be archived in a comma-delimited ASCII format that is platform-independent by using the Access_to_ascii.mdb utility developed by NCPN, which is provided to parks along with the database. These files are saved in the 'version_archive' directory, in the subdirectory created for each version. File names will consist of the table name with a .txt extension. Example:
\version_1-00\tbl_nest_location.txt

At the end of a field season when all data have been entered, verified and validated, an annual archive copy of the front and back ends will be made (see Version Control, above).

A copy of all archived data sets, both version archives and annual archives, should be sent to NCPN within 2 weeks of their creation.

All archived files should be designated as "read-only." These files must be stored on a server or hard drive that has a regular and secure backup routine that includes off-site storage rotation. NCPN does not recommend using CDs or DVDs for long-term archival storage because of potential media degradation.

Hard Copies and Originals
Original data sheets and photographs, if used regularly or stored improperly, will deteriorate over time. Original hard-copies of field data will be used for data entry and data validation, then copied onto acid-free paper. The copies will be stored on-site at the park in project binders and the originals will be accessioned into park or regional archives on an annual or biannual basis. Project leaders should coordinate with their park's curator for specific details on preparing materials for archiving.

All original photographs or slides will be placed in archival-quality polypropylene sleeves. Slides will be labeled using indelible pigment ink or using laser-printed archival-quality labels. Photographs should have an archival-quality label attached to the back of photo and should not be written on directly. However, copies of photos can have notation indicating the nest ledge. Label information will include: a unique ID, project name, photographer, photo date, a brief identification of contents (e.g., species name, territory ID), and geographic location (UTMs or description). Archival-quality materials can be obtained from Light Impressions (www.lightimpressionsdirect.com).

In addition, all slides and photographic prints will be scanned and saved (preferably as 600 dpi TIFF files). The filename of the scanned image should be entered into

photo_filename field in tbl_image. Digital images should be used as the primary means of distributing or reproducing the images; slide and prints should be accessioned into park or regional archives for long-term storage under controlled conditions. If data are managed at the park level, copies of digital images will be provided to NCPN on an annual basis. The same procedures apply to sketches of nest sites or birds; file names should be entered in the nest_sketch_filename or other_digital_filename fields in tbl_image.

Table 7-1. Processing and disposition of project data

Data Item	Action	Database	Working Project Binder	Archive
field notebook	make two copies of pertinent pages		copy	investigator keeps original. Museum keeps one copy
USFWS data form	make two copies; send one to state contact	enter data	copy	museum keeps original
raptor observation record card		enter data	copy	museum keeps original
raptor nest card		enter data	copy	museum keeps original
digital photos of nest sites	one set on CD to accompany report	enter digital file name in database	hard copy	electronic copy on backed-up server or hard disk; hard copy to museum
photo prints or slides of nest sites	scan images as TIFF files, 600 dpi minimum	enter digital file name tbl_image	copy	museum keeps originals (note: nest locations are marked on a copy, not on the original photo print)
sketches of nest sites	scan sketches; one set on CD to accompany report	enter digital file name in tbl_image	copy	museum keeps original
maps	make two copies; one accompanies report		copy	museum keeps original
protocol update		create archive copy (both Access and ASCII) before update		save on backed-up server or hard drive; send copies to NCPN

Table 7-1. cont.

Data Item	Action	Database	Working Project Binder	Archive
end-of-season verified/validated database		create archive copy		save on backed-up server or hard drive; send copy to NCPN
annual report - electronic	save as Word file and as .pdf			save on backed-up server or hard drive; send copy to NCPN
annual report – hard copy			copy	museum keeps original
metadata	complete or update dataset catalog record		print out copy and place in binder	send updated record to NCPN

VII. Metadata

Each table and field in the Access database will be defined and documented. In addition, the table tbl_datamgt_log provides a location for tracking data manipulations or updates, and for storing ongoing notes on the status of data verification and validation.

Each park will complete a Dataset Catalog record for the project and database, and will update the record contents annually. A copy of the updated record will be provided to NCPN. Any GIS data resulting for the project that is used for distribution or analysis will have an FGDC-compliant metatdata record completed.

The complete protocol for this project (Protocol Narrative and SOP #s 1-10) is an integral component of the project metadata. All narrative and SOP version changes are noted in the Master Version Table (MVT), which is maintained in SOP #10. Any time narrative or SOP versions change, a new Version Key number (VK#) must be created and recorded in the MVT, along with the date of the change and the versions of the narrative and SOPs in effect. The Version Key number is essential for project information to be properly interpreted and analyzed. *The protocol narrative, SOPs, and data should not be distributed independently of this table*.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 8

Data Analysis and Reporting

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) provides instructions for: 1) writing annual summary reports, and 2) for periodic trend analysis and reporting for Peregrine Falcon monitoring in the Northern Colorado Plateau Network (NCPN).

I. Annual Reports

An annual report should be written following each season of Peregrine Falcon monitoring. The purpose of the report is to summarize the data for the current year, as well as to provide a limited comparison with data from previous years. Annual reports should be produced under the direction of the designated Principle Investigator for the park unit.

Procedures:

1. Reports should be written following standard NPS scientific format. Guidelines for this format are located at:

   http://www1.nrintra.nps.gov/pub-page/handbook/All2-04.htm#P1227_80620

2. Report the following standard survey parameters for the current year, at a minimum:

   - Number of occupied territories
   - Number of successful nesting pairs
   - Number of fledglings per territorial pair
   - Number of fledglings per successful pair

The current-year parameter values should be added to a table that lists similar measures for all monitored years. Definitions for these parameters are explained at the end of SOP #5, Conducting the Peregrine Falcon Survey.

3. Reports should be accompanied by copies of maps or sketches available. Also, a CD should be included that contains all of the survey data in electronic form, including the database, photographs, and UTM locations of territories.
4. Reports should be completed by October 1 after the field season, and submitted to the Principal Investigator.
5. The Principal Investigator should provide a copy of the report and associated data to the NCPN data manager for archiving. See Table 7-1 of SOP #7, Data Management, for the disposition of project data.
6. Banding data, if any, should be reported to the Bird Banding Laboratory. Instructions for submitting banding information are provided by: Gustafson, M. E., J. Hildenbrand and L. Metras. 1997. The North American Bird Banding Manual Version 1.0 (http://www.pwrc.usgs.gov/bbl/manual/manual.htm).

II. Trend Assessments

Trend assessments of three key parameters should be conducted after 3-5 years of monitoring, and potentially every year thereafter. Trends analyses may be conducted at the individual park unit if numbers of territories and observations are sufficient for a statistically meaningful assessment. The Principle Investigator of the Peregrine Falcon monitoring should supervise the park-based analysis of trend assessments. It is most likely that limited sample sizes will require aggregating data among park units for trend assessments. Upon request by participating park units, the NCPN Ecologist will conduct network-based assessments of trends. In either case, trends in the three key parameters (territory occupancy, nest success, productivity) should be evaluated using the first procedure described below. Where data are aggregated among park units, the second procedure described below may be applicable.

Procedures:

1. For each parameter, trends should be determined by regressing the parameter values on time and determining the significance of the slope coefficient (e.g., Nur et al. 1999). Linear regression methods are most desirable for evaluating trends, but data often must be transformed to fit a linear model. There are numerous texts and examples on how to determine when data should be transformed, and transformation methods (e.g., Norvell et al. 2003, Nur et al. 1999, Sabin and Stafford 1990, Kleinbaum and Kupper 1978, Neter and Wasserman 1974). These or similar articles should be reviewed before performing trend analyses. In brief, plotting the data (annual values vs. year) will aid in determining an appropriate transformation. If the plotted values are noticeably linear over time, no transformation is required. If curvilinear trends are evident, data transformation is required. Also, heterogeneity of variance and related issues must be addressed prior to fitting linear models (see Sabin

and Stafford 1990). After determining data transformation needs, any statistical package can be used to perform data transformation and least-squares, linear regression. The ANOVA table of the regression will indicate the significance of model fit and of the slope parameter. A significant model fit and slope parameter indicate a trend different from zero, where the sign of the slope parameter indicates the direction of change (increasing or decreasing), and the magnitude of the slope parameter equates to the rate of change. The occurrence of a significant trend, the direction of the trend, and the magnitude of the trend should be reported for each of the three monitored parameters.

2. Where data are combined among park units, it may be useful to evaluate park-level or sub-regional trends. This will depend on the number of participating park units and the number of observations. Plot the parameter values with a park-unit indicator (e.g., color codes for individual park units) and look for non-coincident trends among individual or aggregates of park-units. If plots suggest trend differences, dummy-variable analysis should be employed to determine statistical differences in slopes among groupings. Dummy-variable analysis is an extension of linear regression. Data transformation needs and regression procedures are identical to those used in procedure #1 described above. The only difference is that the design matrix (i.e., the input data matrix) must be modified with dummy (i.e., indicator) variables, and multiple ANOVA tables are generated and used in statistical tests. Chapter 13 in Kleinbaum and Kupper (1978) provides a simple how-to description of dummy-variable analysis. In general, this analysis derives a trend slope for all designated groupings (e.g., individual or aggregates of park units), and determines if they are significantly different. Significant differences in slopes will indicate different trends among the selected park-unit aggregates; otherwise trends should be considered similar.

3. Bayesian analysis offers numerous advantages to frequentist approaches (e.g., those described in #1-2 above), especially where the lack of measurement precision detracts from deriving significant trends (Wade 2000). Employing Bayesian analysis in trend assessments of the three monitored parameters for Peregrine Falcon is encouraged. Wade (2000) provides a simple overview on the use of Bayesian analysis in trend assessments. More detailed descriptions of this analytical method are provided in Gelman et al. (1997). Simplified procedures for conducting a Bayesian analysis will be developed and standardized, as much as possible, by the NCPN Ecologist. Before attempting these analyses, the NCPN Ecologist should be contacted to determine the status of procedures. Well tested, standardized procedures will be incorporated into this SOP as they are developed.

4. Trend assessments at the park level should be included with the annual reports. The standard reporting format should be followed, but with a special emphasis on description of analyses, and interpretation and discussion of results. Annual reports should be distributed to the NCPN Data Manager for archiving.Trend assessments with data combined among park units will be conducted, upon request, by the NCPN Ecologist. A network-wide report will be produced that will include a summary of

the monitoring data from participating park units, and methods, results, and interpretation and discussion of trend-assessment results. Trend-assessment reports will be distributed to participating park units and the NCPN Data Manager for archiving.

III. Re-Evaluation of Sample Effort

A re-evaluation of sampling effort relative to the variability of parameter measures should be performed every 3-5 years using standard power-analysis methods. This ensures that sample-size needs are sufficient to satisfy the sampling objectives. As indicated in the NCPN Peregrine Falcon Monitoring Protocol narrative, sampling objectives will be determined after evaluation of historical data. Given specified sampling objectives, power analysis should be used to determine if sampling effort should be adjusted to better achieve the objectives. Methods for power analysis are nicely summarized in Nur et al. (1999). Free-ware, PC-based power analysis programs (e.g., Trend – Gerrodette 1987) will be made available by the NCPN Ecologist upon request. Alternatively, upon request, the NCPN Ecologist will perform these assessments.

IV. References

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Norvell, R.E., F.P. Howe, and J.R. Parrish. 2003. A Seven-Year Comparison of Relative-Abundance and Distance-Sampling Methods. The Auk **120**:1013-1028.

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American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 9

After the Field Season

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) describes general post field-season procedures for monitoring Peregrine Falcons in the Northern Colorado Plateau (NCPN) park units. Observers should review and follow this SOP upon completion of the field season.

Procedures:

1. Clean and repair all equipment prior to returning them to their proper storage areas. List any needs for equipment repair/replacement. All reference manuals should be re-shelved on their appropriate bookshelf. Other reference materials and extra data sheets need to be filed in their appropriate filing cabinet. Clean the insides and outsides of all vehicles used in the field.

2. Organize field data sheets and check that they have been filled out completely. As a rule, all data sheets need to be reviewed for completeness before the observer(s) leaves the field. At the end of the season, one Raptor Observation Record Card and Eyrie Record Card (if appropriate) needs to have been completed for each nesting or potential territory visited.

3. Enter data from the Raptor Observation Record Card, the Raptor Eyrie Record Card, and UTM locations of territories into an electronic database. Follow data management instructions in SOP #7, Data Management, to ensure accurate and complete data entry.

4. Digitize all photographs (or sketches if no photographs are available), label them following labeling instructions in SOP #7, and put on a CD to include with the final report. These digitized photographs or sketches are also included in the database.

5. Write a final report following standard NPS scientific format (see SOP #8, Analysis and Reporting).

6. Data should be entered, and completed cards, banding schedules (if any), and a brief report should be submitted to the Principle Investigator by 1 October of the year of the survey.

American Peregrine Falcon Monitoring Protocol for the Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) # 10

Revising the Protocol Narrative and SOPs

Version 1.00 (December 15, 2004)

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This Standard Operating Procedure (SOP) explains how to make and track changes to the Narrative and Standard Operating Procedures for the Northern Colorado Plateau Network (NCPN) Peregrine Falcon Monitoring Protocol. Individuals editing the Protocol Narrative or any one of the SOPs need to follow these procedures in order to eliminate confusion on how data are collected and analyzed. All observers conducting the survey should be familiar with this SOP in order to identify and use the most current methods.

Procedures:

1. All modifications to the protocol must be reviewed for clarity and technical soundness. Small changes or additions to existing methods will be reviewed in-house by NCPN Inventory and Monitoring staff. An outside review is required for whole-scale changes in methods. Regional and National staff of the National Park Service and experts outside of the Park Service with familiarity in bird monitoring and data analysis will be used to review major changes.

2. All changes must be documented, and updated protocol versions must be recorded in the Revision History Log that accompanies the Protocol Narrative and each SOP. Changes are recorded only in the Protocol Narrative or the SOP being modified. Version numbers increase incrementally by hundredths (e.g. version 1.01, version 1.02, etc.) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0 …). Record the previous version number, date of revision, author of the revision, identify paragraphs and pages where changes are made, and the reason for the changes along with the new version number.

3. Narrative and SOP updates may occur independently. That is, a change in one SOP will not necessarily invoke changes in other SOPs; a narrative update may not require SOP modifications. The NCPN tracks the narrative and SOP version numbers in a Master Version Table (MVT), which is maintained in this document (SOP #10). Any

time a narrative or an SOP version change occurs, a new Version Key number (VK#) must be created and recorded in the MVT, along with the date of the change and the versions of the narrative and SOPs in effect. The VK number increments by whole integers (e.g., 1, 2, 3, 4, 5). Updates to the MVT also must be provided to the NCPN Data Manager for inclusion in the master version table database. *The protocol narrative, SOPs, and data should not be distributed independently of this table*.

4. New versions of the protocol narrative and SOPs must be posted on the NCPN web page. Older versions of the Protocol Narrative and SOPs must be archived in the NCPN Peregrine Falcon Protocol Library: (X:\Archive\Monitoring_Archive\Peregrine_Falcon\Protocol_Library\).

5. Revisions to the NCPN Peregrine Falcon survey protocol should be shared and coordinated with other NPS networks that have protocols for Peregrine Falcon surveys.

American Peregrine Falcon Monitoring, Northern Colorado Plateau Network
Master Version Table

Version Key #	Date of Change	Narrative	SOP 1	SOP 2	SOP 3	SOP 4	SOP 5	SOP 6	SOP 7	SOP 8	SOP 9	SOP 10
VK1	12-15-2004	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00